CDM Camp Dresser & McKee

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION PHASE II REMEDIAL INVESTIGATION/ FEASIBILITY STUDY WORK PLAN

Prepared For:

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1.0 INTRODUCTION

The work plan has been prepared to define the scope of activities required to perform Phase II of the Remedial Investigation/Feasibility Study (RI/FS) at the Southeast Rockford Groundwater Contamination site in Rockford, Illinois. The Phase II remedial investigation will involve a source investigation, groundwater investigation, residential well sampling and residential air sampling. Initial sampling events in the study area by the Illinois Department of Public Health (IDPH), the USEPA Technical Assistance Team (USEPA TAT) and Illinois Environmental Protection Agency (IEPA) indicated than an east-west trending plume of volatile organic compound (VOC) contaminated groundwater extended from the vicinity of 8th Street and Wills Avenue to the vicinity of 23rd Street and Reed Avenue. Additionally, Rockford Water Utility (RWU) has experienced VOC contamination in several of its municipal wells since 1981. Municipal Unit Well 35, which is located within the study area, was taken out of normal service in 1985 due to VOC contamination. The original site boundaries for the Southeast Rockford Groundwater Contamination site were proposed for inclusion on the National Priority List (NPL) in June 1988, and the site was added to the NPL in March 1989 as a state-lead, federally funded Superfund site.

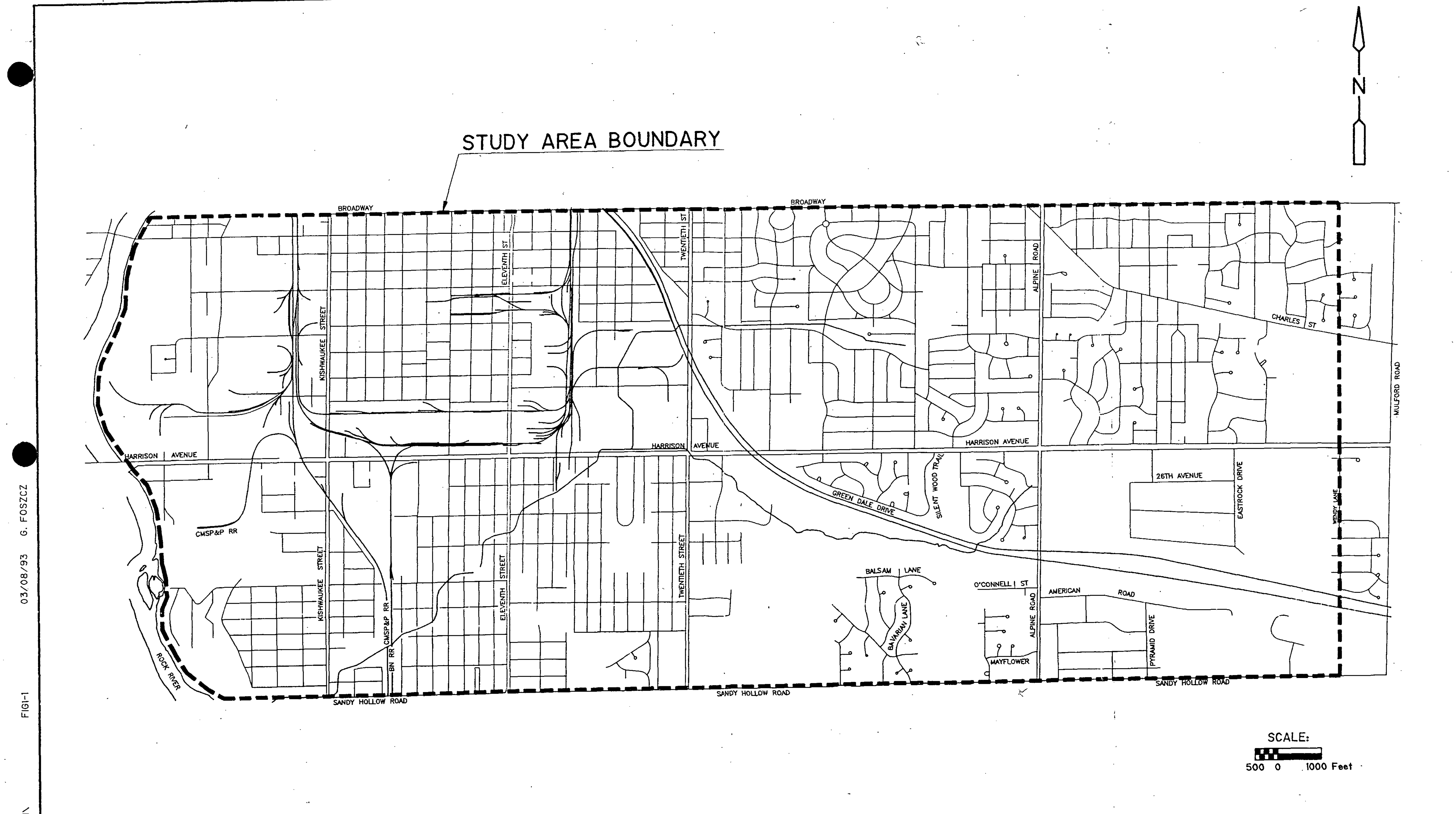
From June to November of 1990, USEPA Emergency Response Section conducted a "removal action" which consisted of providing water main extensions and service connections to residences with private wells that equalled or exceeded 25 percent of the Removal Action Level for VOCs. Concurrent with this removal action, Camp Dresser & McKee Inc. (CDM), under the direction of IEPA, conducted the Operable Unit Remedial Investigation and Feasibility Study. This study consisted of sampling of 117 residential, commercial, and industrial wells for VOCs and metals, identifying areas where contaminant concentrations exceeded MCLs and evaluating alternative water supply options for private well owners. As a result of this study, additional water main extensions and service connections were installed and a granular activated carbon treatment system was installed at Municipal Unit Well 35 (UW35) so that it could be brought back into service to ease the increased water demand.

From June to October of 1991, CDM and its subcontractors, under the direction of IEPA, conducted the Phase I Remedial Investigation. In Phase I the study area was expanded from the original NPL site boundaries to an area of approximately 5 square miles. The Phase I area was bounded on the north by Harrison Avenue, on the south by Sandy Hollow Road, Wendy Lane to the east and the Rock River to the west (see Figure 1-1). Phase I activities included a 225-point soil gas survey, installation of 33 monitoring wells at 11 locations, hydraulic conductivity testing, sampling and analysis of the 33 Phase I wells, 19 Illinois State Water Survey (ISWS) wells and 16 industrial wells, and subsurface soil sampling during drilling. The Phase I study was designed to define the nature and distribution of groundwater contamination, define local geology and hydrogeology, and to gain preliminary information on potential contaminant source areas.

The results of the Phase I investigation indicate two areas of groundwater contamination of volatile organic compounds, including one area located near the industrial facility southeast of the intersection of Harrison Avenue and Alpine Road, and a larger area near and downgradient (west-northwest) from well nest MW106 (see Figure 1-2). Near the downgradient extent of this plume, several plumes, possibly related in part to the larger plume, are located west and southwest of MW20.

Based on elevated VOC concentrations in soil gas or groundwater, potential source areas were also identified during the Phase I investigation, as follows (see Figure 1-2): 1) upgradient from well nest MW106 (Area 7); 2) upgradient from well nest MW101 (Areas 5 and 6); 3) at the industrial facility southeast of Harrison Avenue and Alpine Road (Area 8); and 4) several discrete locations in industrial areas in the western part of the study area (Areas 1 through 4).

As discussed in the Phase I Work Plan, the Southeast Rockford study is being performed as a phased RI due to the large size of the affected area, the relatively undefined nature of the geology and hydrogeology and the numerous potential contaminant sources. At the conclusion of the Phase I field activities a Technical Memorandum was prepared and a



SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY

STUDY AREA

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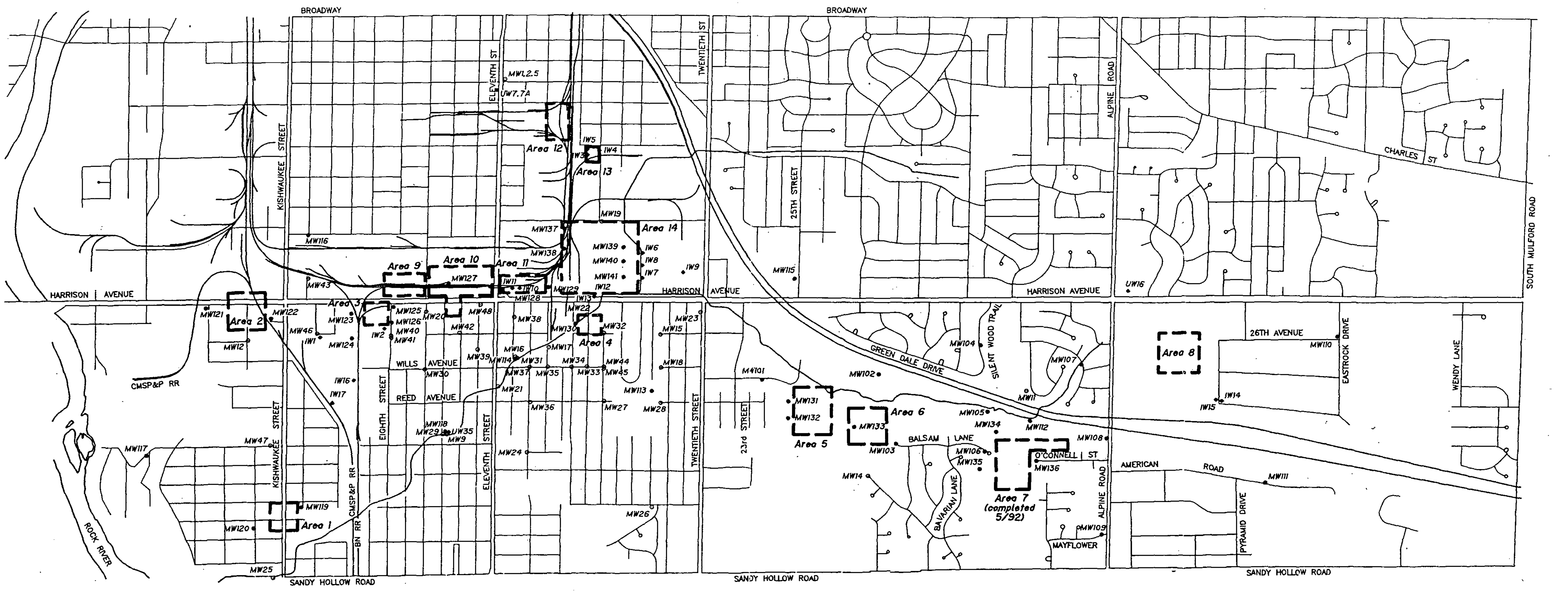
Figure No. 1-1



LEGEND:

- MW11 EXISTING ISWS MONITORING WELL
- MW101 EXISTING (MW101 THROUGH MW111) AND PROPOSED (MW112 THROUGH MW141) CDM WELL NESTS
- IW14 EXISTING ON-SITE INDUSTRIAL SUPPLY WELL OR MONITORING WELL
- UW16 EXISTING OR ABANDONED MUNICIPAL SUPPLY WELL
- Area 1 POTENTIAL SOURCE AREA AND PHASE II SOIL GAS SURVEY AREA (NOTE : SOIL GAS WORK WILL NOT BE CONDUCTED IN AREA 6 OR AREA 8.)

N

SCALE:
500 0 1000 Feet

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY

EXISTING AND PROPOSED MONITORING WELLS, POTENTIAL SOURCE AREAS AND PHASE II SOIL GAS SURVEY AREAS

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Figure No. 1-2

I:\CAD\168\ ... \RI\PLN\ FIG1-2 03/08/93 G. FOSZCZ preliminary groundwater model was set up. Also, additional information became available regarding potential source areas that had not been investigated in Phase I. The design of the Phase II investigation is based on the data gaps identified in Phase I, an assessment of data needs based on the preliminary groundwater model and an evaluation of the additional potential source information provided by USEPA and IEPA.

The Phase II study is necessary to: 1) fill identified data gaps within the Phase I study area; 2) provide preliminary information in the newly-added portion of the study area north of Harrison; 3) provide sufficient information on potential source areas to allow an evaluation of the need for future work; 4) gather sufficient data to perform a risk assessment for the groundwater; 5) gather sufficient data to expand and refine the groundwater model; and 6) gather sufficient data to support the feasibility study.

CDM recognizes that because of the large size of this site, the numerous potential sources of contamination and the fact that several different agencies are conducting studies in the area concurrently, there is a high probability for scope changes during the course of the Phase II activities. CDM will keep the IEPA informed throughout the project of all investigation findings and will make recommendations for any scope changes we feel necessary due to these findings. CDM also anticipates that additional information will become available from IEPA and USEPA during the course of Phase II that may necessitate scope changes (including, but not limited to, responses to 104E information requests, and any information resulting from ongoing enforcement activities), and we will work with IEPA to develop the appropriate change orders to accommodate the changes.

The work plan provides a description of the study area in Section 2, the scope of work for the Phase II RI activities in Section 3, the feasibility study scope of work in Section 4, project staffing in Section 5, and project schedule in Section 6.

2.0 STUDY AREA DESCRIPTION AND INITIAL EVALUATION

The study area for Phase II is located in Southeast Rockford in Winnebago County and covers approximately 10 square miles. The study area is bounded by Broadway to the north, Wendy Lane to the east, Sandy Hollow Road to the south, and the Rock River to the west. The area is shown in Figure 1-1. The northern boundary of the Phase I study area was Harrison Avenue. The study area has been expanded northward to Broadway because sampling results have indicated that source areas may exist outside the original site boundaries and it appears that the contamination plume also extends beyond the Phase I study area.

2.1 <u>GEOLOGIC SETTING</u>

The stratigraphy of the study area consists of bedrock with locally significant subsurface relief that is overlain by unconsolidated glacial sediments of variable thickness. The uppermost bedrock unit is generally dolomite, which forms a north-south subsurface valley (parallel to the Rock River) greater than 200 feet deep in the western part of the study area. Glacial sediments are thickest within this bedrock valley and thinnest on the valley flanks. The glacial sediments and the bedrock constitute two hydraulically-connected aquifers; no areally extensive aquitards were identified.

2.1.1 BEDROCK

The following discussion regarding the bedrock refers only to that part of the study area where drilling was conducted in Phase I, namely the area east of 20th Street and between Harrison Avenue and Sandy Hollow Road. Bedrock within the Phase I study area was predominantly tan to brown dolomite with variable but small amounts of chert and shale- or bentonite-rich horizons. The chert fraction of the drill cuttings was generally less than 5 to 10 percent and usually white or light gray. Shale or bentonite was frequently brown and usually constituted less than 10 percent of the cuttings; small amounts of pale green shale were also observed. The observed lithology of the drill cuttings is consistent with the general description of the Galena Group (Ordovician age) given by other workers and with the known areal extent of this stratigraphic unit in the Rockford area (Willman and Kolata, Illinois St. Geol. Surv. Circular 502, 1978).

Porous zones, described as vuggy, are common throughout the Galena Group (Willman and Kolata, 1978). Vugs are voids in the rock that are larger than one-quarter inch. Although it was not possible to determine the presence of distinct vuggy zones from drill cuttings, it is possible that vugs or vuggy horizons were responsible for the occasional loss of drilling fluids and grout because of the greater porosity and permeability expected in these zones. Fractured zones, which could also be responsible for the loss of drilling fluids, could not be observed during drilling. Although fractured zones were not discussed by Willman and Kolata (1978), such zones could be of local importance (Kolata, personal communication).

From October 1992 through February 1993, the U.S. Geological Survey (USGS) drilled and conducted borehole testing at three locations (BH-1, BH-2, and BH-3) in the study area, and installed monitoring wells in two (BH-1 and BH-2) of the three boreholes. The locations of these two wells corresponds with Phase I well nests MW101 and MW103. Following the drilling through the unconsolidated sediments, 6-inch or 8-inch casing was installed and grouted in place. Drilling in the bedrock then proceeded using the air-rotary method; drilling continued to depths of 220 to 254 feet. Borehole testing was then conducted in the uncased portion of the borehole, and comprised natural gamma-ray logging (measures clay content), three-arm caliper logging (measures borehole diameter), borehole flow logging through use of the heat-pulse flowmeter and spinner flowmeter, logging of temperature and resistivity, and assessment of fractures and voids intersecting the borehole through use of acoustic televiewer logging. These borehole testing methods enabled correlation of horizontal features (i.e. bedding planes) among the three drilling locations, the location and extent of zones of porosity in the bedrock, and zones of preferential fluid flow in the bedrock. Vertical flow within the borehole was measured at up to 4.8 ft/min; at all three locations, flow was directed downward. Horizontal flow could not be measured with the geophysical logging methods that were employed; however, it is likely that the magnitude of horizontal groundwater flow in the borehole was significantly lower than the measured vertical flow velocity.

The vertical flow observed during the USGS testing cannot be used to estimate horizontal or vertical flow under natural conditions away from the borehole. This is because of the physical presence of the 6-inch borehole, which acted as a conduit connecting upper and lower portions of the bedrock aquifer; under natural conditions, the various intervals of the bedrock are separated by solid rock which is much more resistant to fluid flow than the open borehole. As flow was directed downward at each location, the open borehole acted as a drain that focussed the flow of water. The measured vertical flows therefore signify the presence of a head difference between the various bedrock intervals penetrated.

Groundwater samples were collected by isolating 10-foot intervals of the open borehole with inflatable packers and pumping the interval with a Bennett pump. Between four and seven zones were sampled in each borehole. Chemical analysis of the samples showed that the concentration of total VOCs varied from less than 15 μg/L at BH-3 to more than 4,300 μg/L at BH-1. While high contaminant concentrations in bedrock were already known to exist at MW101(BH-1) and MW103 (BH-3) based on Phase I sampling, the USGS packer testing defined specific depth intervals containing high contaminant concentrations.

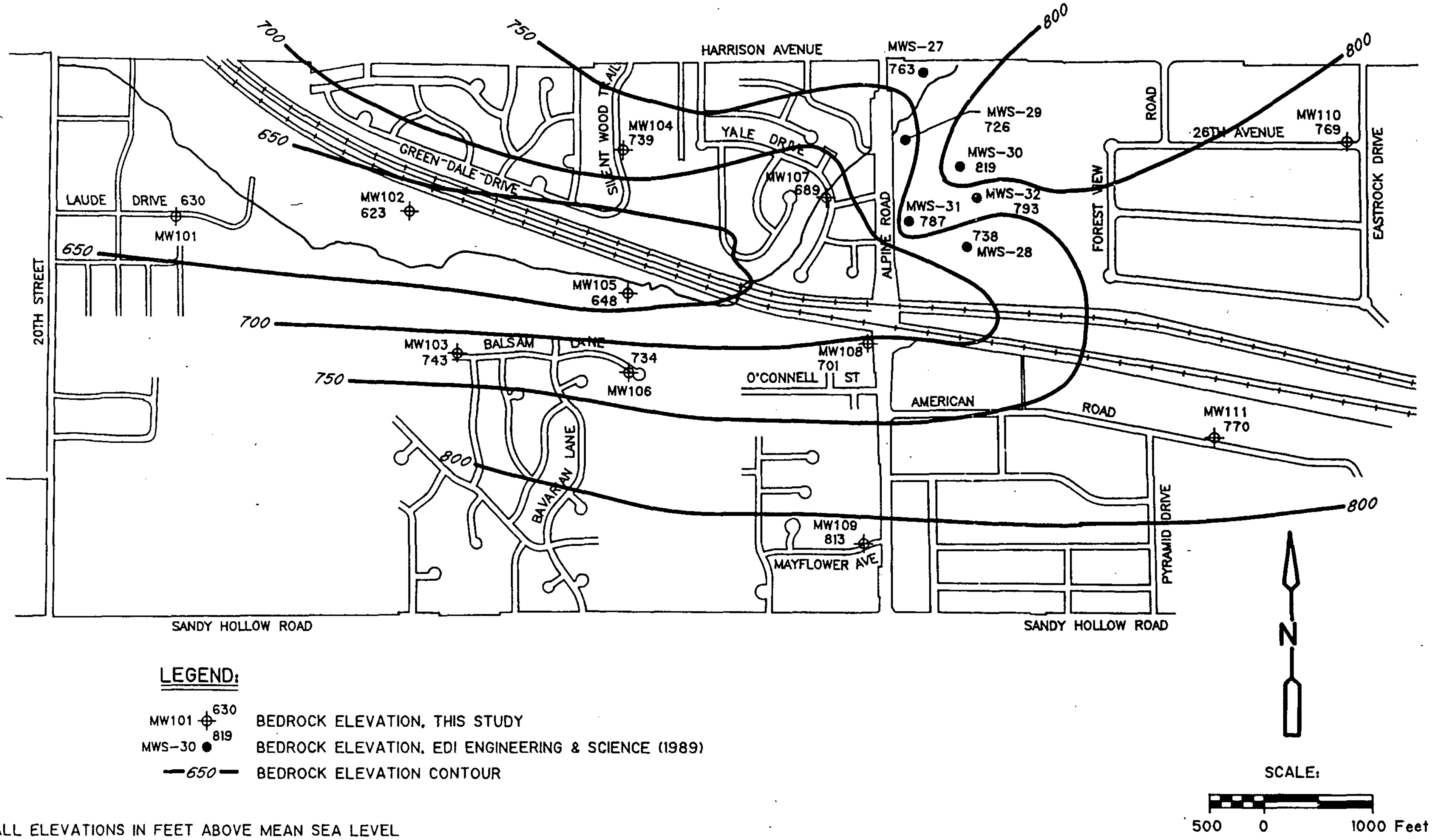
The major findings of the USGS work are that: 1) porosity exists in much of the bedrock tested, 2) certain stratigraphic horizons may have higher porosity and permeability, therefore acting as preferential pathways for groundwater flow, and 3) intervals of high VOC concentrations in bedrock were defined at MW101 and MW103.

Based on the loss of drilling mud or grout and the presence of localized voids observed during Phase I and USGS drilling, vuggy or fractured zones may be present at or near the bedrock surface and within the bedrock. High-permeability zones near the bedrock surface could be related to a weathered zone formed during past exposure at the surface before the overlying glacial sediments were deposited.

The high-permeability zones found in bedrock during the Phase I remedial investigation require further study during Phase II because these zones could be a preferential path of contaminant migration. Specifically, areal distribution, horizontal continuity, and hydraulic conductivity are the primary factors determining the importance of high-permeability zones as a preferred pathway. The Phase I investigation showed that high-permeability zones are present at or near the bedrock surface in some parts of the study area. The Phase II investigation will include determination of permeabilities in these zones and whether they are interconnected, or whether they occur in separated areas only. If the high-permeability zones exhibit significant interconnection across the study area (particularly near potential source areas), then they could be paths of preferential flow capable of transporting contaminants significant distances over a short time interval. Identification of contaminant pathways and their permeabilities is essential for determining contaminant travel times and, ultimately, for pinpointing source areas. Determining the nature and extent of high-permeability zones will also provide important input for refining the initial groundwater model of the study area. The groundwater model will be instrumental in helping predict current and future contaminant distributions, as well as in locating source areas and evaluating remedial alternatives.

The subsurface topography of the bedrock for the portion of the study area investigated in Phase I is shown on Figure 2-1. This figure is based on depth-to-bedrock data obtained during Phase I drilling, as well as previous work done by EDI Engineering and Science (Results of Hydrogeologic Evaluation for Sundstrand Corporation, Rockford, Ill., Aug. 1989). The overall shape of the bedrock surface is that of a narrow, east-west valley that widens and deepens toward the west, ultimately joining the larger north-south valley to the west. East of Twentieth Street, the depth to bedrock is less than 175 feet; to the west bedrock is generally greater than 200 feet deep. Unconsolidated glacial sediments have filled in the bedrock valleys and buried the entire bedrock surface within the study area.

D:\1661\ \PLN\ FIG2-2 06/24/92 G. FOSZCZ



SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY

SUBSURFACE BEDROCK TOPOGRAPHY

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Figure No. 2-1

2.1.2 UNCONSOLIDATED GLACIAL SEDIMENTS

A variety of unconsolidated glacial sediments, ranging from silt and clay units to sand and gravel units, are found within the study area. These units are laterally discontinuous over short horizontal distances and vary in thickness between well nest locations. For example, the two significant clay layers at MW105 do not exist at either MW104 or MW106, a short distance away (Figure 2-1). These clay units probably pinch out to the north and south, although the upper clay unit may grade laterally into the clayey silts at MW104 and MW106. The complex lateral relationships of the stratigraphic units and the limited subsurface information make stratigraphic correlations difficult. Additional boreholes would provide a more refined understanding of the subsurface stratigraphy.

In the western portion of the study area (west of 20th Street), drilling logs for 17 ISWS wells indicate that sediments down to 85 feet (637 feet elevation, MSL) are predominantly sand and that no clay units are present.

2.1.3 AQUIFERS

Based on Phase I drilling, two shallow aquifers were identified based on the available lithologic information: one in the unconsolidated glacial sediments and one in the dolomite bedrock. However, additional bedrock aquifers exist beneath the dolomite; immediately beneath the dolomite is the St. Peter Sandstone, which is followed downward by the Eminence-Potosi Dolomite (formerly called Trempealeau Dolomite), Franconia Formation, Galesville Sandstone, Eau Claire Formation (Sandstone-Shale), and Mt. Simon Sandstone. The units from the St. Peter to the Mt. Simon yield water to municipal wells that provide the City of Rockford with a major portion of its water supply, and are therefore of concern for this investigation, particularly for the groundwater modeling effort. During the preliminary groundwater modeling conducted during Phase I, only the units between the unconsolidated sediments and the Eminence-Potosi Dolomite were incorporated into the model. The final model will encompass all units down through the Mt. Simon. The discussion below centers on the unconsolidated glacial sediments and the dolomite bedrock, the two aquifers explored during Phase I drilling. These two units will hereafter be referred to as the unconsolidated and bedrock aquifers, respectively. No areally continuous aquitards were encountered in either aquifer, indicating that the unconsolidated and bedrock aquifers are hydraulically connected. Within the unconsolidated aquifer, laterally discontinuous clay layers of significant thickness (15-20 feet) were found, especially in sediments occupying the deeper parts of the buried bedrock valley (e.g. at MW102 and MW105). The clay layers are localized and do not extend continuously across the study area. Locally, clay layers and clay-rich zones probably cause perched water tables, such as at MW102, where there is an 18-foot head difference between the shallow and intermediate depth wells. Although regionally extensive, thin clay-rich horizons do occur in the dolomite bedrock (Willman and Kolata, 1989), none were identified in this study. The influence of bedrock vugs or fractures on groundwater flow cannot be assessed using Phase I data.

In both aquifers, the general direction of groundwater flow is westward. Horizontal hydraulic gradients are roughly half as large east of Bavarian Lane as those found between Bavarian and 20th Street; however, gradients in the unconsolidated aquifer are approximately ten times smaller west of 20th than they are between Bavarian and 20th Street. The smaller gradients west of 20th reflect the considerably higher hydraulic conductivities west of 20th. Vertical hydraulic gradients exist between the two aquifers east of 20th Street, with downward gradients being more prevalent. Vertical gradients are near zero west of 20th Street.

2.2 CONTAMINANT AND SOURCE ASSESSMENT

2.2.1 GROUNDWATER CONTAMINATION

Studies conducted by the IEPA, IDPH, USEPA, TAT and CDM indicate a number of contaminants detected in the groundwater in the study area. The historical ranges of detection for the major contaminants of concern at the site are listed in Table 2-1.

Chlorinated organic compounds have been the constituents detected the most frequently and at the highest concentrations in the study area. The compound 1,1,1-trichloroethane (TCA) is the contaminant which has been detected at the highest concentrations, followed by trichloroethene (TCE), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), tetrachloroethene (PCE), and cis-1,2-dichloroethene (cis-1,2-DCE). Several of the compounds detected (cis-1,2-DCE, 1,1-DCA, 1,1-DCE, chloroethane, and vinyl chloride) are not used in large quantities for industrial or other purposes within the study area, but are common degradation products of TCA and TCE.

Phase I sampling results indicate two major areas of groundwater contamination of volatile organic compounds: 1) a large area near and downgradient (west-northwest) from well nest MW106; and 2) a smaller area centered on the industrial facility southeast of the intersection of Harrison Avenue and Alpine Road. Figures 2-2 and 2-3 show the two major areas of groundwater contamination. Also, data from the Operable Unit sampling shows that smaller contaminant sources may exist west-southwest of MW20.

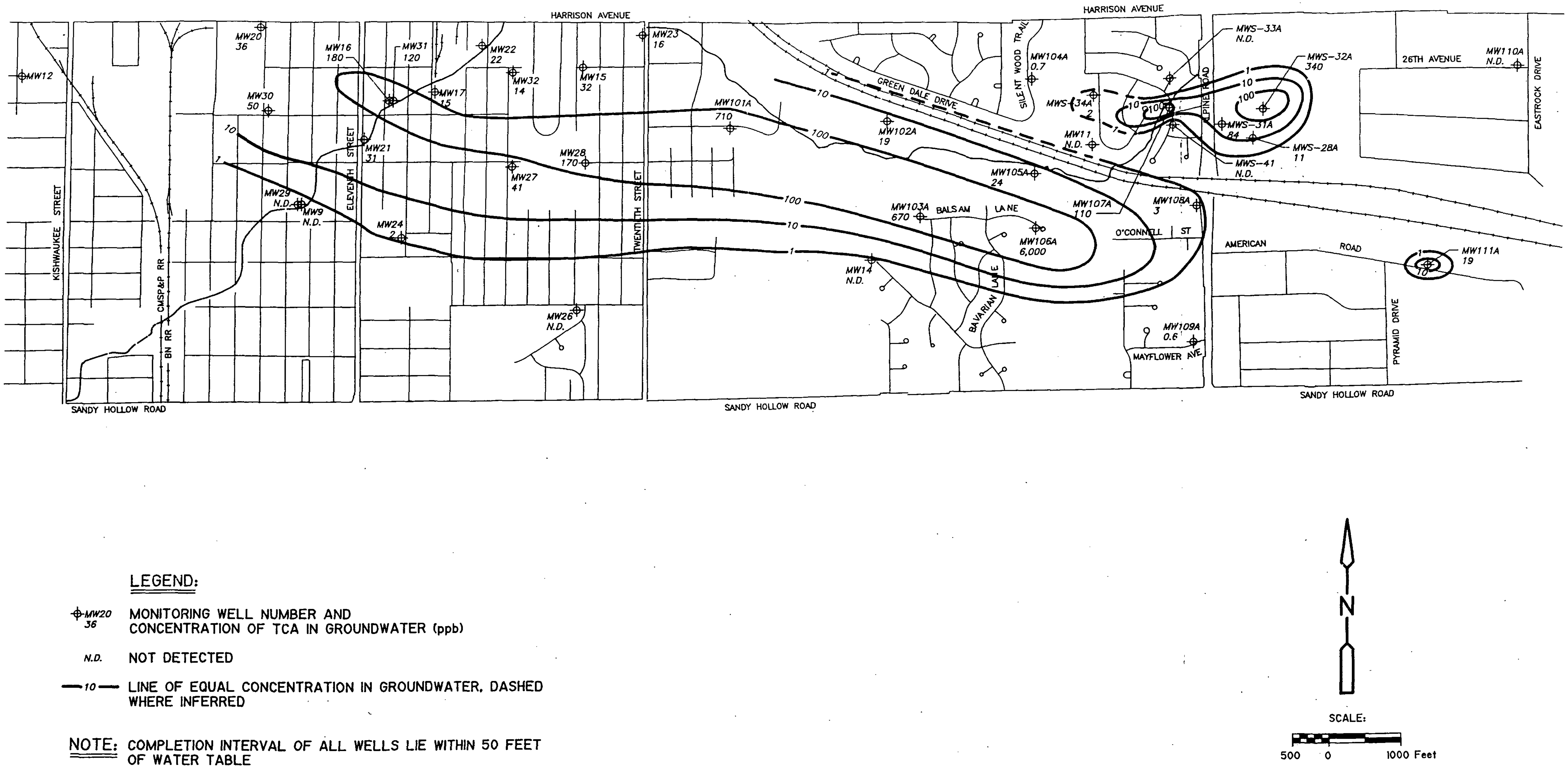
Though several localized detections were reported for Phase I samples, there is no evidence of significant migration of semi-volatiles, pesticides, or inorganic contaminants in the groundwater. Aluminum, iron, and manganese exceeded secondary MCLs in some groundwater samples; these occurrences probably reflect a combination of natural concentrations and localized contamination.

TABLE 2-1

HISTORICAL CONCENTRATION RANGES OF CONTAMINANTS DETECTED AT SOUTHEAST ROCKFORD STUDY AREA

MAJOR CONTAMINANTS	RANGE (μg/L)
Trichloroethene (TCE)	ND to 3,600
1,1,1-Trichloroethane (1,1,1-TCA)	ND to 12,000
cis-1,2-Dichloroethene (cis-1,2-DCE)	ND to 4,100
trans-1,2-Dichloroethene (trans-1,2-DCE)	ND to 55
1,1-Dichloroethene (1,1-DCE)	ND to 940
Tetrachloroethene (PCE)	ND to 1,200
1,2-Dichloroethane (1,2-DCA)	ND to 62
1,1-Dichloroethane (1,1-DCA)	ND to 2,900

ND = Not Detected.



LEGEND:

MW20 36 — MONITORING WELL NUMBER AND CONCENTRATION OF TCA IN GROUNDWATER (ppb)

N.D. — NOT DETECTED

10 — LINE OF EQUAL CONCENTRATION IN GROUNDWATER, DASHED WHERE INFERRED

NOTE: COMPLETION INTERVAL OF ALL WELLS LIE WITHIN 50 FEET OF WATER TABLE

D:\1681\PLN\ FIG2-3 06/24/92 G. FOSZCZ

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY

1,1,1-TRICHLOROETHANE CONCENTRATION IN GROUNDWATER
UNCONSOLIDATED AQUIFER

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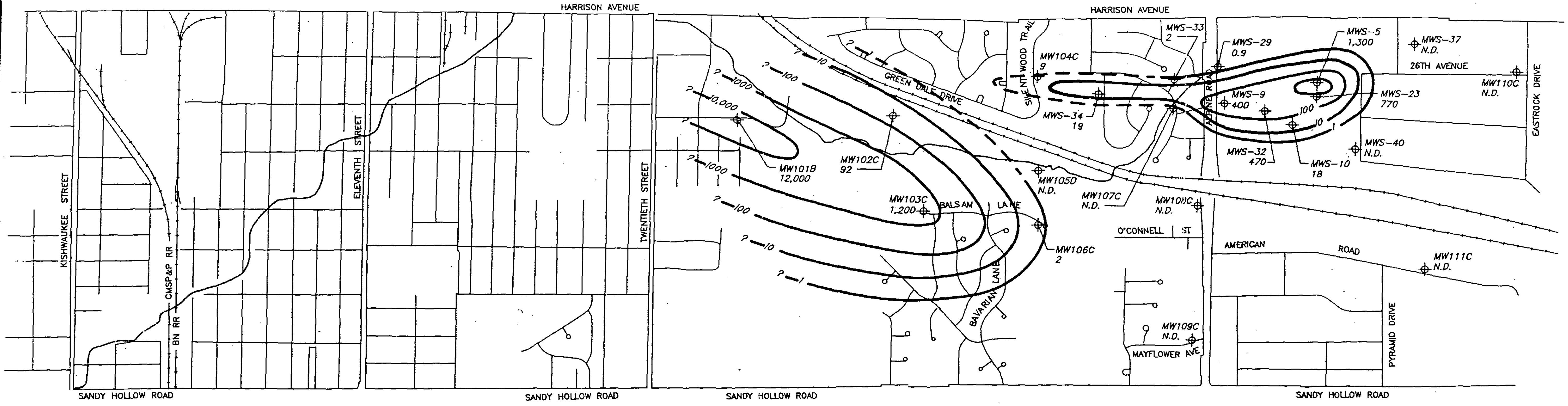
Figure No. 2-2



LEGEND:

MW20 36 — MONITORING WELL NUMBER AND CONCENTRATION OF TCA IN GROUNDWATER (ppb)

N.D. — NOT DETECTED

—10— LINE OF EQUAL CONCENTRATION IN GROUNDWATER, DASHED WHERE INFERRED

NOTE: COMPLETION INTERVAL OF WELLS LIE WITHIN 50-150 FEET OF WATER TABLE

N

SCALE:
500 0 1000 Feet

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY

1,1,1-TRICHLOROETHANE CONCENTRATION IN GROUNDWATER BEDROCK AQUIFER

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Figure No. 2-3

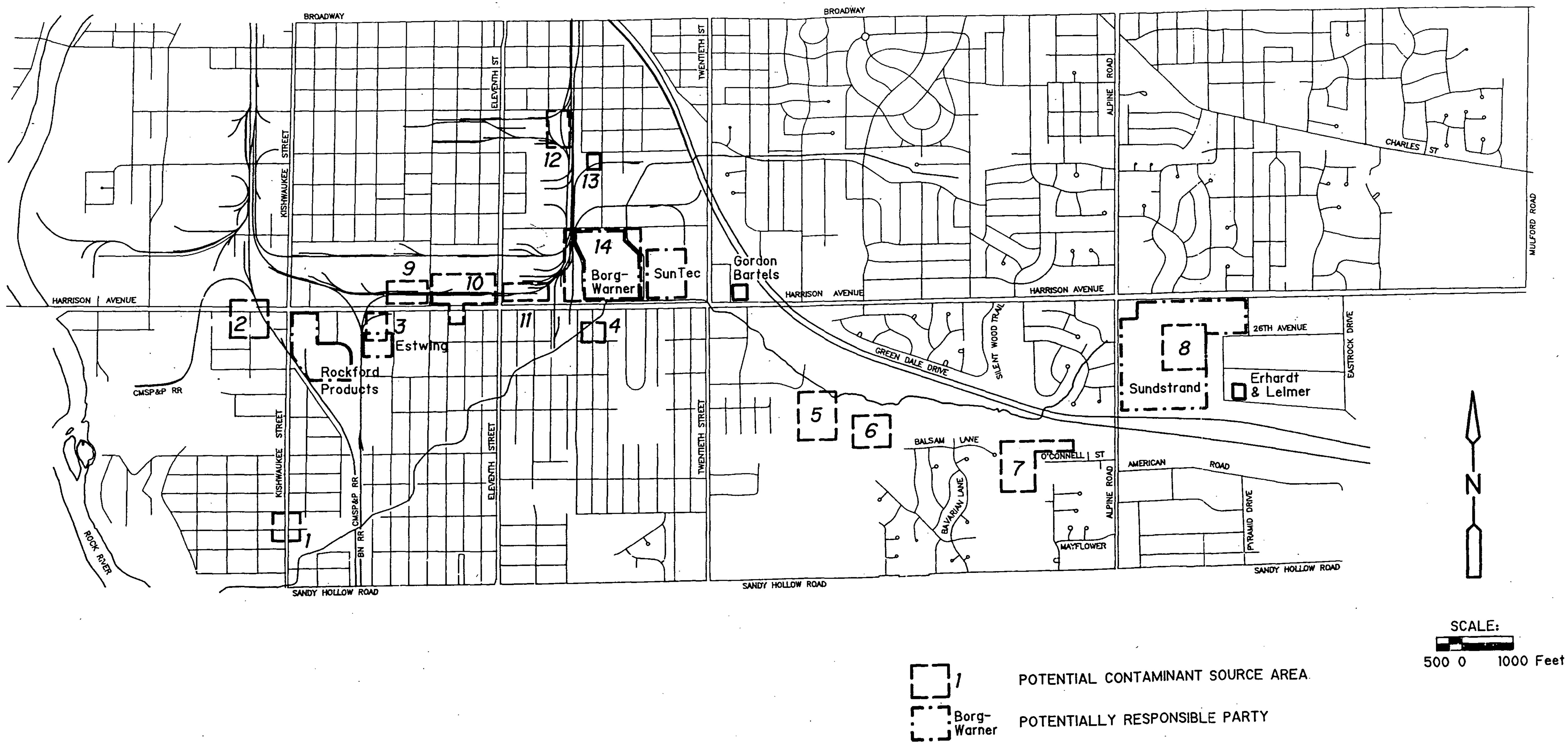
D:\1681\PLN\ FIG2-4 06/24/92 G. FOSZCZ

2.2.2 POTENTIAL GROUNDWATER CONTAMINANT SOURCE AREAS

Utilizing a groundwater modeling program, CDM was able to fingerprint groundwater contamination throughout the study area, map the migration of contaminant plumes from their potential source areas, and delineate water table contours within the study area.

The two major areas of organic groundwater contamination, described above, may originate from separate sources, based on their apparent spatial separation. The fingerprints of the other contaminated areas west and southwest of MW20 are different from those located in the two major contaminated areas. These fingerprints (based on the relative concentrations of the most abundant contaminants) are consistent with the existence of nearby potential contaminant sources in the soil, as suggested by the Phase I soil gas survey results, further discussed in subsection 2.2.3.

As a result of the Phase I sampling, groundwater modeling, and soil gas survey work, several potential source areas were identified at the site. Potential source areas are located as shown on Figure 2-4 and are labelled Areas 1 through 8. Subsequent to Phase I, CDM examined information on industrial operations and defined additional potential source areas that are proposed for investigation during Phase II. These areas are labelled 9 through 14 on Figure 2-4. The information examined included IEPA files from the Rockford office, and information on facility practices provided to the USEPA by industrial enterprises, under an ongoing enforcement action. This information is summarized in the following pages. Also included in these pages is information regarding the facilities of several potentially responsible parties (PRPs) that are not proposed for Phase II soil gas or soil boring work, and are therefore not assigned numbers for potential source areas. Other investigative work will be conducted during Phase II at most of these areas, generally comprising the collection of on-site groundwater samples from existing wells at the facilities.



SOUTHEAST ROCKFORD

POTENTIAL CONTAMINANT SOURCE AREAS
AND POTENTIALLY RESPONSIBLE PARTIES

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Figure No. 2-4

D:\1681\...PLN\ FIG2-5 06/23/92 B. SELIGA

SWEBCO MANUFACTURING, INC. (POTENTIAL SOURCE AREA 4)

Swebco Manufacturing, Inc. at 2630 Marshall is a precision contract machining shop producing metal parts. The present management acquired ownership in 1985 under the name of Pro-Tool Manufacturing Co. then changed to Swebco Manufacturing, Inc. in 1990. The company did use a solvent, although its contents are not specified. However, naphthenic distillate petroleum, hydrocarbons, and mineral spirits are all components of compounds used at the facility. There are three underground tanks present, in unknown condition. They are currently thought to be empty, but their past contents were fuel oil and waste oil. The area around the tanks was sampled once, indicating benzene, toluene, ethylbenzene and xylene (BETX) contamination. When asked about past releases, Swebco described two spills of water-soluble coolant. However, Swebco is also involved in a legal dispute with Kenroth Manufacturing, Inc., and the Cherry Valley Bank. The bank is suing Swebco on a number of counts, including that they are damaging the property (the bank's collateral) "by negligently and unlawfully dumping contaminants and toxins such as oil and other chemicals on said real property." This complaint is based on alleged oil-dumping incidents near the chip bin. The Phase II work proposed for the Swebco area comprises soil gas and soil boring work, the installation and sampling of a downgradient monitoring well, and the sampling of existing upgradient monitoring wells. Further details on this proposed work are given in Section 3.

SUNDSTRAND (POTENTIAL SOURCE AREAS 8 AND 10)

Sundstrand operates out of a number of different locations. Plants 1, 6, and 8 (discussed below) of Sundstrand present reason for environmental concern. Also worth noting are storage sheds at 1400 Harrison Avenue at which TCA and/or PCE mixed with oil were routinely used as weed killers from 1962-1980 (Sundstrand response to the Request for Information pursuant to Section 104(e) of CERCLA and Sections 3007 of RCRA, sent by Linda S. Aylward, Senior Associate Attorney, 4/27/89).

Plant 1 at 2421 11th Street is used for the manufacture of aircraft parts for constant speed drives. TCA is produced as a waste solvent at this facility. There were numerous reported spills of JP-4 jet fuel, mineral spirits and waste oil.

Plant 6 at 4747 Harrison Avenue was constructed in 1967. It is used for the testing, assembly, and research and development of aerospace components. TCE was used at the facility until 1979. In 1984, an estimated 600-800 gallons of toluene was released from an underground storage tank. Toluene concentrations in the groundwater reached as high as 591 ppm. A toluene remedial action program was begun. During the investigation into this release, TCA, PCE, TCE, and 1,1-DCE contamination was discovered. It is possible that the contamination was related to USTs that had previously stored TCA, PCE, and other oils and solvents.

In another area of the Plant 6 facility, three other USTs (one had held waste TCA) had been removed in 1986, and were discovered to have had holes. The soil in this removal was contaminated with TCA and PCE up to 1,100 ppm (data is referenced in Summary Report, Plant 6 Facility Tank Farm Investigation by Harding Lawson Associates, 2/26/91). There are also some miscellaneous incidents in the files available for review: a release of an unknown volume of PCE in 1987, a 1990 analysis of soil showing 6.3 ppm PCE (Closure Plan, Plant 6 Soil Pile, Harding Lawson Associates, March 4, 1991), and a 1990 explosion which led to the release of a small amount of TCA vapor, which may have been cleaned up before release into the environment.

Plant 8, located in the south-central portion of the Sundstrand facility at 4747 Harrison Avenue, is used for the testing of various aerospace components. There is an afterburner tank that intermittently overflowed from 1966-1979, spilling waste water with possible traces of hydrazine and solvents to a field south of Plant 8. Other spills of acids and bases, ethylene glycol, and JP-4 also took place. In July 1990, a waste oil tank located near the southeast corner of the Plant 8 building, overflowed. Soil samples during the subsequent investigation indicated 190 ppb TCA, 230 ppb PCE, and PAHs at up to 22,000 ppm (Letter Report, Soil Boring Investigation, Harding Lawson Associates, April 25, 1991).

The Phase II work proposed for Sundstrand facilities includes soil gas and soil boring work near Plant 1 and near the storage sheds at 1400 Harrison Avenue.

ROCKFORD COATINGS CORPORATION (POTENTIAL SOURCE AREA 11)

Rockford Coatings Corporation discontinued operations at 1620 Harrison Avenue in 1983. The company manufactured paint products of different colors and types, including air-dry and baking enamels, lacquers, and water-based paints. Use of chlorinated solvents at the facility is unknown. However, all solvents used were stored in above-ground tanks. Waste from the facility was handled by Acme Solvents in the early 1980s. The Phase II work proposed for the Rockford Coatings area includes soil gas and soil boring work, and the installation and sampling of one new monitoring well.

ROCKWELL INTERNATIONAL GRAPHICS (POTENTIAL SOURCE AREA 11)

Rockwell International Graphics at 2524 11th Street manufactured gears and rollers for newspaper presses until approximately 1991. The facility used 1,1,1-trichloroethane for cleaning rollers until 1983. The property is now owned by P.H. Partners Co., which leases it to Rohr Manufacturing. According to P.H. Partners Co., the property was leased to Sundstrand during the Korean War. P.H. Partners denied access for Phase II investigative work on their property. A railroad right-of-way is located adjacent to the property, to the south. This land is owned by Aetna Plywood. There was an environmental assessment performed on the property ("Environmental Assessment, Former Railroad Right-of-Way," by Dames & Moore, 1990), which indicated some areas of concern. The work and sampling results outlined below are from this assessment. One such area was a section of stained soil adjacent to a concrete slab on Rockwell Graphics property. It appeared that a Rockwell Graphics dumpster had leaked cutting oils onto the ground surface. A grab sample of soil indicated 15,900 ppm total petroleum hydrocarbons (TPH). TCE was detected in this area at 21.3 ppb. A monitoring well (MW-3) placed in this area indicated 2.5 ppb PCE, 36.6 ppb TCA, and 7.4 ppb TCE. Also, a pit to the north of Rockwell Graphics property contained standing water with an oily sheen; a soil sample adjacent to this pit contained 460 ppm TPH. Other areas of concern in the right-of-way south of Rockwell Graphics property are a bunker, reportedly used by Rockford Varnish Company (formerly at 11th and Harrison), that was seeping a tar-like substance. A monitoring well (MW-2) in this area indicated 1,150 ppb TCA, and 302 ppb TCE. A second area was the portion of the right-of-way near the above-ground tanks, located just south of the right-of-way. These tanks, some of which held PCE and TCA, may have been the property of the RN Transportation Group. A monitoring well (MW-1) in the right-of-way and near these tanks did not indicate contamination from chlorinated solvents, but did show a concentration of toluene at 604 ppm. Phase II work proposed for the area of the former Rockwell Graphics facility includes soil gas and soil boring work, monitoring well installation, and sampling of existing wells.

VIKING CHEMICAL (POTENTIAL SOURCE AREA 12)

Viking Chemical Company is located at 1827-18th Avenue. A visual inspection conducted while driving past this facility showed the existence of approximately 15 large (approximately 5,000-gallon capacity) above-ground storage tanks that hold a variety of compounds, including some site contaminants of concern (TCA and PCE). The potential of migration of contaminants from the Viking facility to the site will be investigated during Phase II through soil gas and soil boring work, and the installation of monitoring wells to assess the migration of VOCs.

ACME SOLVENT RECLAIMING, INC. (POTENTIAL SOURCE AREA 13)

Acme Solvent Reclaiming, Inc., at 1915 20th Avenue was founded in 1955. They operated until 1986 as a business that recycled contaminated solvent wastes. They were permitted to handle a number of solvents, including chlorinated organics. In a 1980 permit they stated that they handled 2,000,000 gallons of various solvents a year. The facility had a history of spills, leaks, and poor housekeeping. It was reported that approximately 47 rusting, bulging drums were stored at the facility for three years after its closing; these drums were removed by IEPA and sent to ChemWaste Management for incineration. Soil samples taken at a depth of 9'3" under the floor of the building indicated 590 ppm TCA and 226 ppm TCE (letter from Bert Fowler to IEPA, August 7, 1986). A water sample from a nearby deep well indicated no contamination. Highlights of subsequent sampling events included tank scrapings which had 2,700 ppm TCA, 1,700 ppm PCE, and 130 ppm TCE. Water samples from the monitoring wells installed by IEPA indicated 910 ppb TCA, 620 ppb TCE, and 290 ppb PCE. Phase II work in Area 13 will focus on determining whether groundwater contaminants are migrating toward the site from the Acme facility, and will include soil gas work and the collection of groundwater samples from on-site monitoring wells.

BORG-WARNER (POTENTIAL SOURCE AREA 14)

Borg-Warner, formerly at 2020 Harrison Avenue, was a universal joint manufacturing facility that operated from 1938 to 1986. The facility was sold in 1988 to Superior Toy and Manufacturing Company, Inc. During Borg-Warner's operations, steel was processed into finished products including steel bearings, slip joints, universal joints, and metal drivelines.

Chlorinated solvents used at the facility included chloroethane (Environmental Due Diligence Evaluation, ENSR, October, 1988), and trichloroethene and 1,1,1-trichloroethane (information from manifests). Incidences and practices which may have contributed to contamination include alleged dumping of oily sludges along the west side of the northern tract of the facility, disposal practices at a possibly unlined chip pit, and numerous tanks at the facility. Past soil sampling at the chip pit indicated 1,020 ppm cis-1,2-DCE, 627 ppm 1,1-DCA, 111 ppm PCE, 150 ppm TCA and 75 ppm TCE. Soil sampling near the tanks indicated 18.4 ppb PCE and 13.2 ppb TCA (results from Underground Tank and Soil Investigation by Fehr-Graham & Associates, 1/11/88). Initial sampling at a monitoring well installed in 1988 indicated 20 ppb TCA (from 10/26/88 letter by J. Steve VanHook, IEPA).

The Phase II work proposed for the Borg-Warner facility includes soil gas and soil boring work, monitoring well installation (contingent on soil gas results), and sampling of existing on-site wells.

ERHARDT & LEIMER

Erhardt & Leimer, located at 4960 28th Avenue, was originally called General Web Dynamics until January 1991. It is unknown when the company was founded. Erhardt & Leimer is a light industrial metalwork company that performs machine painting, testing, and production. A release of TCA took place prior to the fall of 1984 (response to 104E by Holmstrom & Kennedy, 10/14/91), but there was no additional information regarding this incident in the files available for review. There was also a complaint of alleged dumping of waste TCA and oil on the ground for a six-month period in 1986, but IEPA never discovered any evidence of this practice (RCRA inspection report/IEPA Div. Land Pollution Control, Complaint Investigation, 3/7/86). The facility ceased use of TCA in its plate-cleaning dip tank in March of 1988.

The IEPA investigation of this complaint, however, resulted in the discovery of incorrect storage procedures at the facility. It appears that work associated with the closure plan drawn up to resolve the issue of the storage procedures may have resulted in the discovery of contamination at the site. As a result of this work, three areas of the site were targeted for soil excavation in the mid-1980s. The first was the former drum storage area on the western side of the building where a floor drain near the TCA storage tank was discovered to be leaking. Sampling performed in 1986, presumably pre-excavation, revealed TCA contamination of 54.8 ppb. Approximately 23 cubic yards of soil were excavated in 1987. There were no clearly indicated post-excavation results available in the file for review.

A second area of concern was located at the southeast corner of the building at the location of monitoring well 1D. In 1986, pre-excavation, contamination levels were 25 ppm TCA and 2.1 ppm PCE. Approximately 222 cubic yards of soil were excavated and manifested for disposal in 1987. Post-excavation sampling in 1987 indicated 2.6 ppm TCA. Then, in June 1988, 20 additional cubic yards of soil were removed and manifested. This additional cleanup was performed in order to achieve 1,2-dichloroethane soil concentrations below 100 ppb.

A third area at the northeast side of the building contained oil-stained soils. Soil sampling in this area in 1986 indicated 1,190 ppm TCA and 197.0 ppm 1,1-DCE. Approximately 10 cubic yards of soil were excavated in this area in 1987, but no post-excavation sampling results were given. However, soil sampling performed in 1988 indicated 136 ppb PCE, 3.6 ppb TCE and 2.1 ppm TCA.

Numerous monitoring wells have been installed on the premises. Initial concentrations of TCA in the groundwater were greater than 1 ppm in 1986; a comprehensive monitoring program was begun in 1988. These wells were monitored quarterly by Fehr-Graham & Associates until third quarter 1991, when Missman, Stanley & Associates performed the monitoring. Well 14D had shown a TCA increase in May 1991. Recent data from these wells, measured in July 1992, indicate TCA levels at 590 ppb and PCE levels at 160 ppb. A recovery well also exists on-site. Though the pumping schedule for this well is unknown, any pumping there would tend to retard any off-site migration of contaminants originating from the facility.

The Phase II work proposed for the Erhardt & Leimer facility consists of the collection of a groundwater sample from one downgradient, off-site (Sundstrand) monitoring well. The results of groundwater sampling from the Erhardt and Leimer facility are submitted to IEPA; this information, combined with the nearby Sundstrand well, will allow assessment of the extent of downgradient contaminant migration from this recent incident.

ESTWING

Estwing, located at 2647 8th Street since 1928, manufactures hand tools such as hammers, hatchets, and pry bars. TCA is used as a lubricant, in the form of an aerosol from 16-ounce cans. Approximately 24 of these are used per year. From 1982 to 1987 it was alleged that waste paint-related materials (solvents, thinners, and paints) were disposed of in an on-site pit at the back of the facility. An IEPA FIT investigation found soil concentrations of TCA and PCE to be 2 ppb each in the grassy area south of the parking lot. Some semivolatile compounds were detected at 9.6 ppm. Groundwater samples from the production well (sampled in June 1990) contained 528 ppb TCA, 533 ppb 1,1-DCA, and 110 ppb 1,1-DCE. The Phase II work proposed for the Estwing vicinity consists of the installation and sampling of upgradient monitoring wells, and the collection of a groundwater sample from the existing on-site production well, if still accessible.

ROCKFORD PRODUCTS

There are two plant locations for Rockford Products: Plant 2 is located at 612 Harrison, and Plant 3 is located at 707 Harrison.

Plant 2 is engaged in the zinc plating, packaging, and shipping of cold-formed steel products, primarily bolts, screws and nuts. There is no specific mention in the files available for review of the use of chlorinated solvents, except for the production of TCE waste from cleaning agents. There were a number of storage tanks onsite, and sampling at one above-ground tank indicated 775 ppb PCE.

Plant 3 was constructed in 1954 to manufacture screws, bolts, and metal fasteners. For a nine-year period beginning in 1976 it operated under the name Rexnord. TCE was used as a degreaser at the site prior to 1980. TCA was also used at the site; in 1985, 220 tons of TCA were purchased, and in one year at least 120 tons of TCA were emitted from the stacks of the degreasers, in excess of the permitted 20 tons. This TCA may have subsequently condensed, fallen onto the roof and drained toward the seepage pit discussed below.

A one-acre seepage pit, created in the 1950s, has been the center of environmental concern at the facility. It was used to collect storm and cooling water, but has also been used for the disposal of waste oil (the sides of the pit were observed to be coated with oil), as well as many other wastes. TCA vapor, emitted from a stack on the roof, condensed onto the roof and eventually the contamination was washed into the pit. Also, a contaminated production well (one sample indicated 200 ppb TCA) is used to supply cooling water which is eventually discharged into the pit. Surface water samples of water in the pit in 1984 indicated 66 ppb TCA, 66 ppb TCE, and 6 ppb PCE.

Monitoring well samples collected in 1985 by M. Rapps Associates, Inc. confirmed that contamination was present in the groundwater, indicating up to 199 ppb TCA and 452 ppb TCE; subsequent samples from these wells had considerably lower concentrations (less than 40 ppb of each compound). Soil samples taken in 1989 indicated 70 ppb TCA adjacent to the pit. Aside from the pit, there is also a landfill and UST on site. And in 1986, approximately 50-100 gallons of TCA was spilled onto the roof, and drained into an open ditch on the property. TCA, however, was not detected in subsequent soil samples.

The Phase II work proposed for the Rockford Products facilities consists of the collection of groundwater samples from one production well and from one existing monitoring well, both at the Plant 3 location.

SUNTEC INDUSTRIES, INC.

The Suntec facility at 2210 Harrison Avenue was formerly a Sundstrand facility involved in the manufacture of fuel oil pumps until 1984. At that time the business was purchased by Suntec (although the title to the property remained with Sundstrand) and the facility was used for the manufacture of printed wiring boards, and for photo operations. There is little specific information as to what solvents were or are used at the site. There were a number of USTs which contained Stoddard solvent and oils. Although historically these tanks (twelve USTs and two AGSTs in a vault) were not supposed to have contained chlorinated solvents, a soil gas survey (conducted by Environmental Resources Management [ERM], 5/1/89) indicated the presence of such compounds, including TCE, TCA, and PCE. Groundwater samples collected by Geraghty and Miller indicated concentrations up to 270 ppb PCE, 240 ppb TCE, 330 ppb 1,1-DCE, and 720 ppb TCA (from a 12/13/90 letter summarizing analytical results of samples collected 11/9/90). Subsequent soil borings adjacent to tanks which had contained machining oils yielded soil samples containing 62 ppm TCA, 38 ppm TCE and 25 ppm PCE. The Phase II work proposed for the Suntec area is the collection of groundwater samples from on-site monitoring wells.

2.2.3 SOIL GAS SURVEY

A soil gas survey was conducted during Phase I between May 13 and June 6, 1991, for the purpose of identifying areas of soil contamination, and locating potential source areas in the study area. Previous groundwater sampling conducted during the Operable Unit phase defined the existence of small plumes of groundwater contamination which are chemically distinct from the two larger contaminated areas. These smaller plumes were the focus of the Phase I soil gas survey. The Phase I survey provided concentrations of TCA, TCE and PCE in soil gas samples, and showed soil gas hits which correlate with the small contaminant plumes; this correlation is based on similar contaminant fingerprints in the soil gas and in the associated groundwater plumes located just downgradient. For instance, several soil gas samples in soil gas area 4 showed elevated TCA concentrations (up to 3400 μ/L), while TCE and PCE were closer to background concentrations (up to 180 and 14 μ/L, respectively). This pattern of TCA-TCE contamination was present in a 1990 Operable Unit sample located approximately 1000 feet roughly downgradient (west-northwest) from the soil gas hits.

As a result of the Phase I work, the areas with elevated contaminant concentrations in soil gas were named potential source areas in the Phase I report. As discussed in more detail in subsection 3.5.2, soil boring and additional soil gas work will be conducted in Phase II in several of these areas (potential source areas 1, 2, 3, 4, 5 and 7) during Phase II. Also, as outlined above and discussed in subsection 3.5.2, soil gas and soil boring work will be conducted during Phase II in several additional potential source areas (areas 9 through 14) identified through the existing information review.

2.3 CONTAMINANT IMPACT ON AFFECTED POPULATIONS AND THE ENVIRONMENT

Contaminated groundwater in Southeast Rockford has the potential to impact local residents who rely on groundwater as a potable water source. Possible routes of contaminant contact include direct ingestion, dermal contact, and inhalation of volatilized contaminants. According to information collected during the Phase I investigation and the preliminary groundwater modeling effort, the contaminant plume extends across both incorporated and unincorporated areas. In the future, additional residents could potentially be impacted by contaminated groundwater. This potentially affected population includes residents of unincorporated areas who currently are not connected to municipal water supplies, as they are currently located outside of the contaminated area as defined in the Operable Unit study. As further discussed in subsection 3.6, residential well sampling will be conducted during Phase II in order to evaluate whether the contaminant plume may have expanded to affect such residences.

It is not expected that airborne particles pose a threat to residents of the study area. However, this possibility will be addressed in the Phase II investigation through soil sampling in potential source areas, through residential air sampling, and through air sampling during test pit excavation in potential source area 7 (see section 3.5.6).

Contaminants from groundwater discharged from the unconsolidated aquifer to the Rock River may impact biota in the river. Potential impact to the river will be evaluated in the groundwater model, risk assessment, and from groundwater sampling data collected during the RI.

Based on the Phase I data, there may be a potential for VOC vapors to migrate into confined residential spaces, particularly basements, upward from the upper part of the saturated zone, through the vadose zone. Monitoring for VOCs will be conducted in basements located near source areas.

2.4 POTENTIAL REMEDIAL OPTIONS

The Operable Unit investigation and subsequent remedial action was completed in early 1992. The remedial action consisted of providing municipal water supply to the population affected by contaminated drinking water wells as determined by the Operable Unit study. The objective of this remedial action was to protect public health by providing an alternative potable water source for the affected population. An additional round of residential well sampling will be conducted during Phase II (further discussed in subsection 3.6), to determine whether and to what extent the contaminant plume has migrated. If the plume has indeed migrated, then contamination may have affected additional residences beyond those that were hooked up to city water during the remedial action.

In order to provide long-term protection for the population and the environment, remedial action options will be addressed in the feasibility study (Section 4) portion of the RI/FS. To this end, the RI/FS has been designed to gather information to evaluate possible remedial action alternatives. These alternatives may include contaminant source removal, in-situ source treatment, plume containment, aquifer restoration, groundwater treatment at existing municipal wells, the no action alternative, and any other applicable alternatives.

At this time, based on the existing information, two of the more likely remedial options for the groundwater are plume containment and groundwater treatment at existing municipal wells. Water quality data will be collected during Phase II to allow for the evaluation of the more conventional treatment techniques such as air stripping, carbon adsorption and biological treatment. This information will also allow for the evaluation of discharge options such as surface water discharge or discharge to the Rock River Reclamation District POTW.

As many of the source areas are largely undefined with respect to nature and extent of contamination, it is impossible to predict potential remedial options with any accuracy. In addition to defining contaminant source areas, the Phase II source study is designed to gather preliminary data to evaluate the need for immediate action (such as source removal/remediation) or further study to include a risk assessment prior to evaluating remedial options. Significant source areas may be identified as Operable Units and may be studied or remediated separately from this RI/FS.

3.0 SCOPE OF WORK

3.1 PHASE II OBJECTIVES

Data from the IEPA's Operable Unit Remedial Investigation and Feasibility Study and Phase I Remedial Investigation, both conducted by CDM under the IEPA's direction, indicates two major areas of groundwater contamination of volatile organic compounds (VOCs) located within the Phase I study area. According to the Phase I results, significant levels of 1,1,1-trichloroethane (TCA), 1,1-dichloroethane (1,1-DCA) and 1,1-dichloroethene (1,1-DCE) were detected in groundwater in an area centered near the industrial facility southeast of the intersection of Harrison Avenue and Alpine Road, and significant levels of TCA, trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE) and 1,1-DCA were detected in groundwater in a large area near and downgradient (west-northwest) from well nest MW106. Near the downgradient extent of this contaminant plume, several smaller plumes located west and southwest of MW20 indicated the presence of TCA, TCE, PCE, cis-1,2-DCE, 1,1-DCA, and 1,1-DCE.

Though several localized detections were reported during the Phase I investigation, there is no evidence in the groundwater of significant migration of semi-volatiles, pesticides, or most inorganic contaminants. Also, recorded exceedances of secondary MCLs by aluminum, iron, and manganese in groundwater within the study area probably reflect a combination of natural concentrations and localized contamination. Thus, for plume characterization during the Phase II investigation, groundwater analysis will be limited to volatile organic compounds. Groundwater contamination in the study area is further discussed in subsection 2.3.

The Phase I groundwater sampling results suggest potential source areas corresponding to the significantly contaminated locations in the following areas: 1) upgradient from well nest MW106 (Area 7); 2) upgradient from well nest MW101 (Area 5); 3) at the industrial facility southeast of Harrison Avenue and Alpine Road (Area 8); and 4) several discrete locations in industrial areas in the western part of the study area (areas 1 through 4).

As stated in the Phase I RI Work Plan, a more extensive and comprehensive investigation of the above-mentioned contamination problems in the study area will be addressed during the Phase II RI. Principal objectives of the Phase II RI are to:

- Gather historical information on the study area utilizing aerial photographs and IEPA and USEPA files to research industrial or other operations to determine the origin and timing of any contaminant release to soil or groundwater.

- Conduct a soil gas survey, advance soil borings, excavate test pits, and install monitoring wells to evaluate potential source areas defined in Phase I, as well as additional potential source areas defined since Phase I from information on industrial activities and land use.

- Define the vertical and horizontal extent of groundwater contamination throughout that portion of the study area between Sandy Hollow Road and Harrison Avenue; in the recently-added part of the study area between Harrison Avenue and Broadway, define contaminant migration pathways between potential source areas and the site.

- Evaluate the potential for any dense non-aqueous phase liquids (DNAPLs) in the subsurface through the collection of soil samples in potential source areas.

- Monitor VOC vapors in residential basements located in areas of elevated contaminant concentrations in shallow groundwater.

- Perform a residential well survey and well sampling program for homes within the Operable Unit study area that have not been hooked-up to public water supply to provide data for the risk assessment.

- Perform groundwater modelling to further define the plume area, predict future contaminant distributions, assist in locating source areas, and assist in evaluating the feasibility of remedial alternatives.

The data generated from the Phase II RI activities will be used in conjunction with the Operable Unit and Phase I data to perform a baseline risk assessment. The objective of the risk assessment will be to assess potential impacts on public health, welfare or the environment from releases to the groundwater in the study area.

Upon completion of the RI report and risk assessment, a feasibility study will be conducted to identify, evaluate and screen potential remedial alternatives.

The schedule for these activities is provided in Section 6. Included in the schedule is provision for finalizing Phase II project plans following IEPA and USEPA comment.

3.2 <u>DATA REQUIREMENTS</u>

In order to meet the objectives outlined in subsection 3.1, the following data requirements have been identified for the Phase II investigation:

- Detailed site map;
- Aquifer characteristics;
- Horizontal and vertical distribution of groundwater contamination;
- Piezometric surface and groundwater flow characteristics in each aquifer;
- Contaminant source areas located in the soil; and
- Indoor air characterization.

The rationale and procedures for obtaining these data are discussed in the following sections.

3.3 DETAILED MAP

In order to present and analyze the results of the site investigation, it is important to use a detailed and up-to-date map of the study area. CDM, utilizing maps provided by the City of Rockford and other commercial sources in Rockford and Chicago, and aerial photographs from 1988, has updated the site maps for the Operable Unit and Phase I study area. These maps are produced using computer-aided drafting and can also serve as the base maps for the groundwater model. These site maps will be further updated as information becomes available during the Phase II study.

3.4 MOBILIZATION

Prior to the start of the field activities, CDM will mobilize to the site. This activity incudes setting up a site trailer and associated utilities, procuring the necessary equipment and supplies, and coordinating with the subcontractors. In the project budget, the cost for most of the field equipment, trailer, utilities and supplies has been included under the mobilization task for ease of review. The costs for personal protective gear and specialized equipment has been included under the specific tasks where they will be used. An additional task that has been placed under mobilization is a project quality management (PQM) meeting. A PQM meeting will be held before the initiation of Phase II work in order to discuss critical issues of the project. The meeting will be attended by key project personnel, including the IEPA project officer, CDM project manager, project hydrogeologist, project groundwater modelers, and project risk assessment professional.

3.5 SOURCE INVESTIGATION

A source investigation will be conducted during Phase II to evaluate potential source areas defined during Phase I and through information searches conducted since Phase I. The main objectives of this source evaluation will be to: 1) determine the connection between contaminant source areas and groundwater contamination at the site; and 2) define the scope and necessity of future source investigations or remedial actions. Detailed source characterization will not be necessary to accomplish these somewhat general objectives; accordingly, the Phase II source investigation will be somewhat general in each of the potential source areas. If warranted, specific source areas may be designated as operable units. Focussed feasibility studies would be performed at such operable units, and would likely include additional sampling, baseline risk assessment, and/or treatability studies. At some potential source areas, property owners are conducting separate investigations and/or cleanup activities that have not been defined at this time.

3.5.1 EXISTING INFORMATION REVIEW

CDM will utilize existing information to evaluate the location and approximate time-frame of contaminant releases, and to define additional monitoring well, soil boring and soil gas locations. The following information will be included in the existing information review:

- Historical information on the study area utilizing aerial photographs;

- Summary of data accumulated by the USEPA 104E requests made to local industrial facilities (see subsection 2.2.2);

- Review of Rockford Field Office of the IEPA files regarding the site;

- Results of CDM's site walk-overs performed throughout the study area;

- Data from previous sampling completed by the IEPA Field Inventory Team (FIT), CDM's Phase I investigation and the Operable Unit.

As an additional source of information, aerial photographs from the period of 1951 to 1988 were reviewed. Significant information resulting from that review is summarized in the rationale table for Phase II soil gas work (Table 3-1).

3.5.2 SOIL GAS SURVEY

Prior to initiation of additional monitoring well installation and sampling, soil gas surveys will be conducted in 12 potential source areas. These areas were identified based on Phase I data, aerial photographs, site visits, and information regarding industrial activities. A rationale for each Phase II soil gas survey area is presented in Table 3-1. These soil gas areas are shown on Figure 2-5 and Drawing 1 of the Work Plan.

Soil gas readings will be utilized to define contaminated areas in or near the potential contaminant sources. Soil gas points will be located at 50' to 200' intervals on grid patterns. The depth of the soil gas probe may vary depending on the depth to groundwater; however, it is anticipated that the survey depth will be in the range of five to seven feet.

Those readings that indicate "hot spots" will be further evaluated through the subsequent advancement of investigative soil borings. Both individual soil gas points and soil borings will be located in the field based on access, underground utility locations, and other appropriate considerations.

3.5.3 SOIL BORINGS

The objective of advancing soil borings is to collect subsurface soil samples to define soil contamination in the vadose zone near potential source areas. Soil borings will be placed in "hot spots" located during the soil gas survey. Borings will be advanced to the water table, a depth of approximately 30 feet. It is anticipated that approximately four borings will be placed in each source area. It is likely that approximately ten borings will be placed in

TABLE 3-1

RATIONALE FOR PHASE II SOIL GAS AND
SOIL BORING WORK AT POTENTIAL SOURCE AREAS,
SOUTHEAST ROCKFORD

Location	Soil Gas Survey Area	Proposed Soil Gas Survey Points	Proposed Soil Borings (Approximate)	Rationale
Adjacent to Kennon Road and Kishwaukee Avenue	1	17	3	Determine existence and extent of any soil contamination by PCE and/or TCE. Wells downgradient contain elevated PCE (545 ppb) and its potential degradation products TCE and cis-1,2-DCE, and a nearby Phase I soil gas sample contained slightly elevated PCE (4 ug/l).
West of Harrison and Kishwaukee Avenues	2	12	3	Conduct more detailed soil gas work along with soil sampling in borings to determine existence and extent of soil contamination at this location. A Phase I soil gas sample contained 120 ug/l PCE; wells roughly downgradient contained elevated PCE and its potential degradation products TCE, cis-1,2-DCE and vinyl chloride.
West of Eighth Street and Harrison Avenue	3	3	1	Determine existence and extent of contaminated soils near phase I soil gas samples that showed moderate concentrations of PCE, TCE and TCA (3 to 5 ug/l). Two downgradient wells contain elevated PCE.
South of Marshall Street and Harrison Avenue	4	27	4	Determine existence and extent of contaminated soils near a Phase I soil gas sample that showed high concentrations of TCA (3,400 ug/l), TCE and PCE; soil gas survey will be centered on and downgradient from a metal parts manufacturing facility adjacent to the Phase I soil gas hit.

TABLE 3-1

RATIONALE FOR PHASE II SOIL GAS AND
SOIL BORING WORK AT POTENTIAL SOURCE AREAS,
SOUTHEAST ROCKFORD

Location	Soil Gas Survey Area	Proposed Soil Gas Survey Points	Proposed Soil Borings (Approximate)	Rationale
Former utility facility (south of Laude Drive and east of 22nd Street)	5	10	3	Determine existence and extent of subsurface soil contamination on and near the former Northern Illinois Gas facility located approximately 1,000 feet upgradient of MW101.. MW101B had the highest contaminant concentrations in Phase I groundwater samples (12 ppm of TCA). Three soil-gas points will be tested across the paved portion of the facility, where 30 above-ground storage tanks existed. Five points will be tested for soil gas constituents in the central and southern parts of area 5, located south of the paved portion. Aerial photos shows that, from at least 1958 through 1970, much of the area was devoid of vegetation. The southern portion had numerous linear trench-like scars visible throughout this time period, and is still partly devoid of vegetation; in the central portion the area devoid of vegetation reached a maximum in 1964 (approximately 250 feet square), but was considerably smaller at other times. Both areas were accessible to vehicles via roads surrounding the paved portion of the facility.
Gravel pit east of area 5	6	0	0	Soil gas testing and soil borings will not be conducted in this area; monitoring wells only will be installed. Recently obtained aerial photos show that only after 1979 did the area become devoid of vegetation. Due to this late date of initiation of suspect activity, it appears unlikely that potential source area 6 was actually a source of contamination to groundwater.

TABLE 3-1

RATIONALE FOR PHASE II SOIL GAS AND
SOIL BORING WORK AT POTENTIAL SOURCE AREAS,
SOUTHEAST ROCKFORD

Location	Soil Gas Survey Area	Proposed Soil Gas Survey Points	Proposed Soil Borings (Approximate)	Rationale
Gravel pit and disturbed areas east of MW 106	7	13	10	Determine existence and extent of soil contamination in a broad area roughly 500 feet upgradient (east-southeast) from MW106A, which contained 6 ppm of TCA in Phase I. In addition, soil gas samples collected during May 1992 showed elevated concentrations of each of the target compounds TCA (up to 3,800 ug/l), PCE (up to 1,100 ug/l, and TCE (up to 690 ug/l). Field observations indicate that several areas in potential source area 7 contain various types of waste materials near the ground surface. Historical aerial photos give further such evidence. Between at least 1958 and 1970, photographs show that two small valleys southeast of MW106 were likely used for disposal of various materials. These are the two areas that showed elevated concentrations of TCA, PCE and TCE in soil gas in May 1992. Further soil gas sampling is needed to define the extent of the area underlain by elevated concentrations of target VOCs.
Northwest of Ninth Street and Harrison Avenue	9	5	2	Determine existence and extent of soil contamination roughly upgradient of a Phase I soil gas hit of TCA, TCE and PCE in potential source area 3 and upgradient of a groundwater "hit", TCE and PCE) in ISWS well MW46.

TABLE 3-1

RATIONALE FOR PHASE II SOIL GAS AND
SOIL BORING WORK AT POTENTIAL SOURCE AREAS,
SOUTHEAST ROCKFORD

Location	Soil Gas Survey Area	Proposed Soil Gas Survey Points	Proposed Soil Borings (Approximate)	Rationale
Area surrounding Tenth Street and Harrison Avenue	10	23	4	Determine existence and extent of soil contamination in area roughly upgradient of MW20. This well is located in the main portion of the groundwater contaminant plume; however, compared to portions of the plume upgradient, MW20 contains higher contaminant concentrations and different contaminant ratios, suggesting a nearby contaminant source.
Northwest of Eleventh Street and Harrison Avenue	11	19	4	Determine existence and extent of soil contamination associated with subsurface areas previously noted to contain oily deposits at the ground surface and contaminants in groundwater. Also determine the existence of soil contamination at former facility where solvents were stored.
Southwest of Eighteenth Avenue and Fourteenth Street	12	12	3	Determine existence of soil contamination at this large facility which contains large solvent tanks; site is also suspected because wells roughly downgradient (Unit Well 7, MW1, MW2 and MW5) show high contaminant concentrations in groundwater (up to 3 ppm VOCs).
Southwest of 20th Avenue and 15th Street	13	5	0	Determine concentration and extent of soil contamination discovered in previous IEPA study.
Undeveloped land east of 2020 Harrison Avenue	14	25	3	Determine existence and extent of contaminated soils in this area; photos show that between 1958 and 1961 the area was the site of heavy equipment activity, with topsoil and vegetation missing across many small areas where disposal of waste may have occurred.

TABLE 3-1

RATIONALE FOR PHASE II SOIL GAS AND
SOIL BORING WORK AT POTENTIAL SOURCE AREAS,
SOUTHEAST ROCKFORD

Location	Soil Gas Survey Area	Proposed Soil Gas Survey Points	Proposed Soil Borings (Approximate)	Rationale
2020 Harrison	14	41	5	Determine existence and extent of soil contamination near location of the chip pit (which may have been unlined) and in area of potential sludge disposal to ground (adjacent to railroad).

potential source area 7, a large area of contaminated soil where previous soil gas samples show two areas with TCA concentrations greater than 2,000 μg/L.

Subsurface soil samples will be collected with a split-spoon sampler in accordance with ASTM standards. Samples will be collected at 5-foot intervals from the surface to the water table, and will be analyzed (to the extent possible, depending on sample recovery) for Target Compound List (TCL) Organics and Target Analyte List (TAL) Inorganics. The samples will be field-screened utilizing an organic vapor monitor (OVM). The two samples exhibiting the highest and the lowest detectable concentrations of VOCs will be secured for analysis. For borings that do not indicate VOC readings from field-screening, the soil sample nearest the water table will be secured for analysis.

3.5.4 MONITORING WELL LOCATIONS, DRILLING AND INSTALLATION

The primary objective of installing monitoring wells in the source investigation is to confirm whether contaminants have migrated from potential source areas to the site. Secondary objectives are to more accurately define the lateral and vertical extent of groundwater contamination, gather additional information for groundwater modeling, further define the local geology and hydrogeology of the study area, and provide data for the risk assessment and for evaluating potential remedial alternatives.

Thirty-two well nests will be installed in the source investigation at locations shown on Drawing 1. However, well locations may be moved in the field depending on the results of the soil gas survey and soil boring data. The rationale for installing each source investigation well nest is described in Table 3-2. The specifications for monitoring well drilling, sampling and other field methods for the source investigation are given below in subsections 3.6.1.2 through 3.6.2.

TABLE 3-2

RATIONALE FOR PHASE II MONITORING WELLS
AT SOUTHEAST ROCKFORD - SOURCE INVESTIGATION

Well Number	Location	Number and Depth of Wells	Rationale
MW119	Fourth Street, south of Sawyer Road	One well (approx. 65 ft.)	Located upgradient of groundwater and soil gas "hits" of PCE (and potential source area 1). This well will help define the PCE source location as well as the extent of groundwater contamination in the area.
MW120	Foley Street, between Kennon and Barry Roads	One well (approx. 65 ft.)	Located downgradient of potential source area 1 and the associated groundwater hit of PCE (545 ppb of PCE). This well will help define the downgradient extent of this PCE groundwater contamination. This location is also upgradient of a TCE and cis-1,2-DCE hit in groundwater; the well will help determine the extent and origin of this TCE/cis-1,2-DCE contamination, and its possible relationship to the PCE contamination.
MW121	Olsen Street and Harrison Avenue	One well (approx. 65 ft.)	Located between a landfill and two residential wells with high concentrations of chlorinated organics (up to 1,517 ppb total VOCs). This well will help determine the relative contributions of the landfill and other potential sources in area 2 to this portion of the plume; also will assist in determining local groundwater gradients and flow directions.

TABLE 3-2

RATIONALE FOR PHASE II MONITORING WELLS AT SOUTHEAST ROCKFORD - SOURCE INVESTIGATION

Well Number	Location	Number and Depth of Wells	Rationale
MW122	Kling Street and Harrison Avenue	One well (approx. 65 ft.)	Located roughly upgradient of a potential source in area 2. This well will help determine the source of the contamination farther downgradient; also will assist in determining gradients and flow directions.
MW123	South of Harrison and east of Sixth Street	One well (approx. 65 ft.)	Located downgradient of areas 3 and 9, and upgradient of ISWS well MW46, which has high contaminant concentrations of TCE (132 ppb) and PCE (109 ppb). This well will help determine the source of the contaminants in MW46, the downgradient extent of any contaminants emanating from areas 3 or 9, and also help in determining groundwater gradients and flow directions.
MW124	East of intersection of Sixth Street and Park Court	One well (approx. 85 ft.)	Located downgradient of a highly contaminated well (over 500 ppb of both TCA and 1,1-DCA) at 2647-8th Street. This well will help define the downgradient fate of the noted contaminants.
MW125	Eighth Street and Harrison Avenue	One well (approx. 42 ft.)	Located downgradient of several potential industrial source areas (areas 9, 10, and 11). This well will define the contribution of these potential sources to downgradient contamination.

TABLE 3-2

RATIONALE FOR PHASE II MONITORING WELLS AT SOUTHEAST ROCKFORD - SOURCE INVESTIGATION

Well Number	Location	Number and Depth of Wells	Rationale
MW126	Eighth Street between Harrison and Alton	Two wells (approx. 55 and 85 ft.)	Located upgradient of the contaminated well at 2647-8th Street. These wells will determine whether the noted contamination derives from the facility at 2647-8th Street or an upgradient source.
MW127	East of Ninth Street and north of Harrison Avenue	One well (approx. 42 ft.)	Located downgradient of two potential industrial sources (in potential source area 10), upgradient from others (in potential source area 9), and near an elevated groundwater "hit" (MW20, which has 378 ppb of 1,1-DCE). This well will help define the relative contributions of the various potential sources.
MW128	Eleventh Street north of Harrison Avenue	One well (approx. 45 ft.)	Located in potential source area 11 approximately 200 feet downgradient of a bunker and an associated monitoring well containing elevated (1,150 ppb) TCA and other compounds, and roughly upgradient of an elevated groundwater "hit" in the main part of the plume (at MW20). This well will show whether the noted contamination has migrated downgradient from the bunker area, and whether it contributes to the contamination in the main portion of the plume.

TABLE 3-2

RATIONALE FOR PHASE II MONITORING WELLS
AT SOUTHEAST ROCKFORD - SOURCE INVESTIGATION

Well Number	Location	Number and Depth of Wells	Rationale
MW129	North of Harrison at Cannon Street	One well (approx. 50 ft.)	Located upgradient of the potential source noted under MW128 and near (and side-gradient to) a well that showed elevated (991 ppb) TCA in the Operable Unit phase. This well will serve as an upgradient well to evaluate the potential source noted above, will help define the extent of contamination near the Operable Unit well noted above, and will also determine the possibility of a northern source for contamination at the Operable Unit well. The well is also downgradient of a portion of area 14, and will determine the downgradient migration of contaminants from that portion of area 14.
MW130	East of Sewell, one block south of Harrison	One well (approx. 42 ft.)	Located 250 feet downgradient of a Phase I gas hit of TCA (3400 ug/l at potential source area 4). This well will test the impact of this potential source on groundwater, and determine any connection to a downgradient hit of TCA (991 ppb, sampled in Operable Unit phase).

TABLE 3-2 RATIONALE FOR PHASE II MONITORING WELLS AT SOUTHEAST ROCKFORD - SOURCE INVESTIGATION			
Well Number	**Location**	**Number and Depth of Wells**	**Rationale**
MW131 (Contingent on soil gas and soil sampling results)	One block east of 24th Street, one block south of Laude Drive	Two wells (approx. 50 and 130 ft.)	Located approximately 400 feet downgradient of the central portion of potential source area 5. This central part showed some trenching in 1958 and was at least partly devoid of vegetation between 1958 and 1970. Area 5 is also suspect because of the especially high contaminant concentrations in the deep well MW101B (12 ppm of TCA), highest of any well sampled thus far. These wells will be located approximately 700 feet upgradient of MW101, and will allow determination of the contribution of area 5 to the contaminant plume.
MW132 (Contingent on soil gas and soil sampling results)	One block east of 24th Street, about two blocks south of Laude Drive	Two wells (approx. 60 and 130 ft.)	Located approximately 400 feet downgradient of the southern part of potential source area 5. This southern portion showed evidence of extensive trenching in 1958, and the area was at least partly devoid of vegetation between 1958 and 1988. MW132 will also be located roughly upgradient of high contaminant concentrations found in wells surrounding 24th and Reed (sampled during the Operable Unit). The MW140 wells will therefore allow determination of the contribution of the southern part of area 5 to the contaminant plume.

TABLE 3-2

RATIONALE FOR PHASE II MONITORING WELLS
AT SOUTHEAST ROCKFORD - SOURCE INVESTIGATION

Well Number	Location	Number and Depth of Wells	Rationale
MW133	Approximately 500 to 1,000 feet east of potential source area 5	Three wells (approx. 40, 80 and 110 ft.)	Located upgradient of potential source area 5. Combined with MW131 and 132, these wells will allow determination of whether the main plume's contamination originates solely from the area upgradient of MW106, or if additional contamination is contributed by area 5.
MW134	Between MW105 and MW106	Two wells (approx. 30 and 75 ft.)	Located roughly midway between MW105 and MW106, downgradient of the northern part of potential source area 7. These wells will allow characterization of the northern portion of the contaminant plume in this area.
MW135	Approximately 500 feet south of MW106	One well (approx. 60 ft.)	Located side-gradient to MW106 and south of the southernmost suspected source areas in area 7. This well is designed to better define the southern edge of the contaminant plume in this area.
MW136	At west end of O'Connell, or north of O'Connell and 1 block west of Alpine Road	Three wells (approx. 30, 70 and 105 ft.)	Located upgradient of any potential sources in area 7. These wells will determine whether contaminants exist upgradient of area 7, thereby defining area 7's contribution to the contaminant plume.

TABLE 3-2

RATIONALE FOR PHASE II MONITORING WELLS
AT SOUTHEAST ROCKFORD - SOURCE INVESTIGATION

Well Number	Location	Number and Depth of Wells	Rationale
MW137 (Contingent on soil gas and soil sampling results)	South of 23rd Avenue, one block west of 15th Street	One well (approx. 42 ft.)	Located immediately downgradient of an alleged disposal area at Borg-Warner (potential source area 14). This well will serve to detect any impact of this disposal area on the groundwater.
MW138 (Contingent on soil gas and soil sampling results)	South of MW137	One well (approx. 42 ft.)	Located immediately downgradient of a pit (possibly unlined) used for disposal of metal chips and that has shown ppm-level soil concentrations of several chlorinated organic compounds. This well will allow detection of any impact of this pit on downgradient groundwater.
MW139 (Contingent on soil gas and soil sampling results)	South of 23rd Avenue near 15th Street	One well (approx. 42 ft.)	Located downgradient of northern portion of undeveloped land that may have been used for disposal of hazardous materials, the well will define any impact on downgradient groundwater. Wells serving as upgradient control for this area will be the existing wells located on Suntec property just east of Borg-Warner.

TABLE 3-2

RATIONALE FOR PHASE II MONITORING WELLS
AT SOUTHEAST ROCKFORD - SOURCE INVESTIGATION

Well Number	Location	Number and Depth of Wells	Rationale
MW140 (Contingent on soil gas and soil sampling results)	South of MW139	One well (approx. 42 ft.)	Same as MW139, but will test central portion of the potential disposal area.
MW141 (Contingent on soil gas and soil sampling results)	South of MW140	One well (approx. 42 ft.)	Same as MW139, but will test southern portion of the potential disposal area.

3.5.5 AREA 7 INVESTIGATION

A geophysical survey and soil gas survey were performed in Area 7 prior to the writing of this work plan. The scope of work for the assessment of Area 7 as approved by IEPA and USEPA is included in Appendix A. A line item has been added to the proposed budget for the Area 7 work; however, this activity is not included on the schedule, as it has already been performed.

3.5.6 AREA 7 TEST PITS

The geophysical survey (terrain conductivity and ground-penetrating radar) in Area 7 delineated areas of disturbed soil and buried debris in unconsolidated glacial sediments. The buried material is located near the ground surface and extends to an unknown depth. Terrain conductivity data indicate that buried material likely includes metallic debris. Soil gas data from Area 7 indicates that VOCs (TCA, TCE, and PCE) are present at concentrations from less than 1 μg/l to over 5,000 μg/l.

To investigate the buried material in Area 7, Phase II field activities will include excavation and sampling of two test pits, drilling and sampling of four soil borings near the test pits, and air sampling at the perimeter of the test pits. The rationale for excavating the test pits is: 1) to evaluate the origin, physical characteristics, and continuity of the buried material; 2) to provide samples for chemical analyses that indicate leachability and mobility (TCLP analyses); and 3) to provide data to evaluate the necessity and extent of future remedial actions in Area 7.

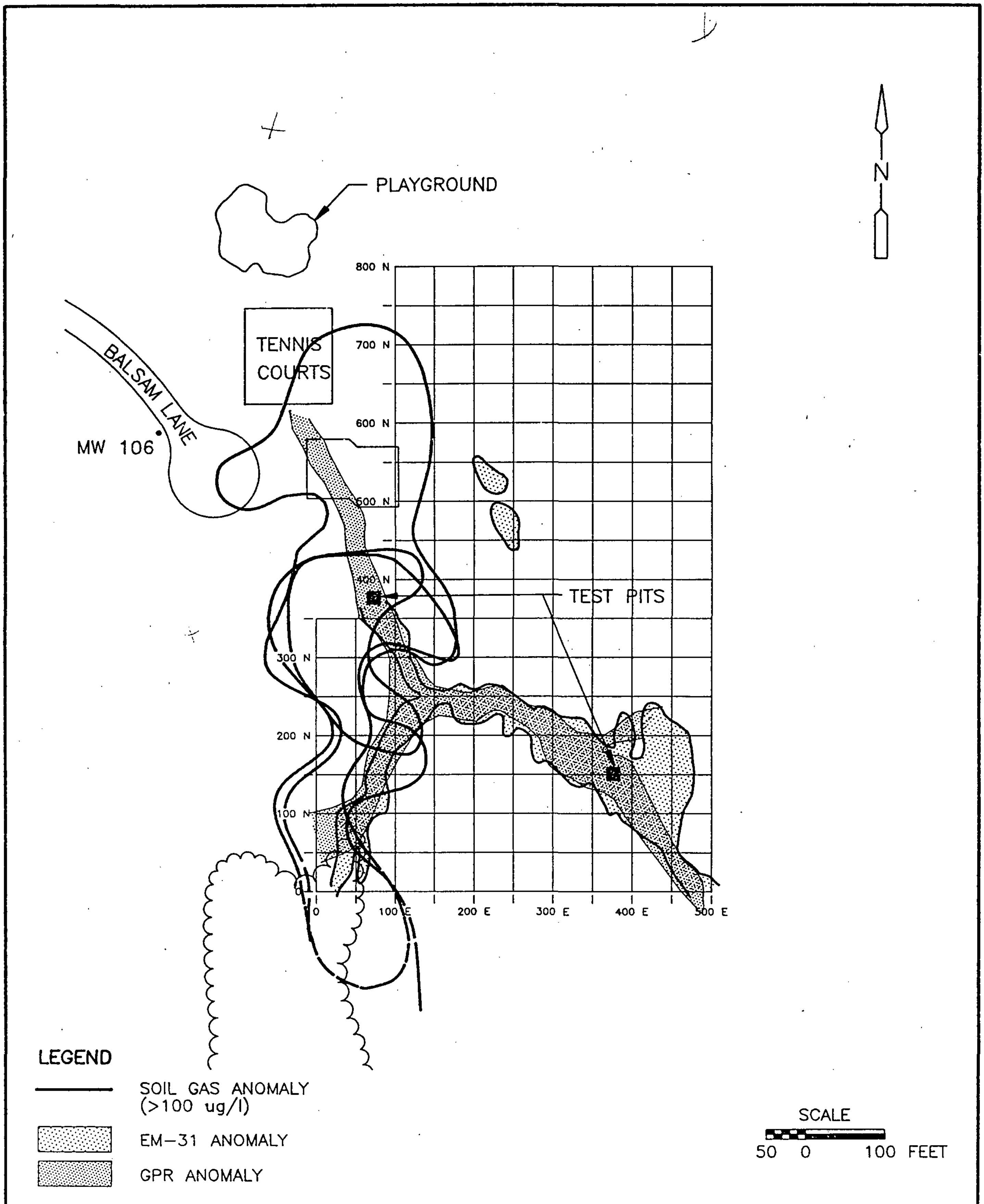
SOIL BORINGS

Soil borings will be drilled adjacent to each test pit in areas that geophysical data indicate no buried material. A total of four soil borings will be drilled to a depth of 15 feet using hollow-stem augers and one split-spoon sample will be collected for every two feet of auger advancement (i.e. continuous sampling), beginning at the ground surface. Level B protection will be required for all drilling and sampling personnel. Drilling personnel will monitor the breathing space and field-screen the split-spoon samples for VOCs. On-site CDM personnel will select soil samples for laboratory analysis; such samples will be analyzed for TCL Organics and TAL Inorganics. Boreholes will be backfilled with drill cuttings. The top layer of soil shall be set aside and used to cover the backfilled borehole.

TEST PITS

Two test pits will be excavated at locations known to contain buried material. the two proposed test pit locations are shown on Figure 3-1. The location centered at 375N, 75E on the grid was selected because soil gas samples showed high VOC concentrations (greater than 1,000 μg/L) at nearby survey points. The second location, at 150N, 375E, was selected because it is in an area of low VOC concentrations (less than 40 μg/L) in soil gas. The pits will be approximately 10 feet wide, 10 feet long, and 15 feet deep. Level B protection will be necessary for personnel excavating and sampling the test pits. Soil samples will be collected using a backhoe bucket. Personnel shall not enter the pits at any time. To minimize the chance of puncturing buried debris, the backhoe bucket shall be toothless. In addition, the backhoe cab shall be protected with an impact-resistant windshield and/or windows. Air monitoring (VOCs) will be conducted during excavation. The pits shall be dug in a timely fashion such that an open pit is not left standing overnight. Test pits will be backfilled with the excavated soils. The top layer of soil shall be set aside and used to cover the backfilled excavation.

Test pit excavation will terminate if Level B protection is not adequate to insure the health and safety of excavation personnel. Excavated material that cannot be replaced in the pit will be containerized in 55-gallon drums and stored on-site. Disposal of excavated material will be the responsibility of IEPA. Cost for the disposal of excavated material has not been included in the Phase II budget.



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SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY
POTENTIAL SOURCE AREA 7

PROPOSED TEST PIT LOCATIONS AND SOIL GAS AND GEOPHYSICAL ANOMALIES

CDM
environmental engineers, scientists, planners, & management consultants

Figure No. 3-1

At test pits, each backhoe bucket will be scanned for VOCs using an HNu, OVM or equivalent, and the contents will be characterized visually. Approximately four samples will be collected from each test pit. Sample selection will be based primarily upon visual characteristics (i.e. soils saturated with product will be selected for analysis), and secondarily upon VOC concentrations (the samples with the highest VOC screening concentrations will be selected). If four samples cannot be selected from a test pit by visual or VOC screening methods, samples will be selected based on geographic coverage, with samples being collected from different portions of the test pit. The analyses to be performed on these samples are TCL organics and TAL inorganics. The two most contaminated samples (based on screening characteristics) will also be submitted for analysis of TCLP parameters.

AIR SAMPLING

Air sampling will be conducted at each test pit, using SKC portable sampling pumps (or equivalent) with Tenax tubes. The SKC sampling pumps will be mounted on tripods and positioned along each side of each pit, and at various distances downwind from each pit. Sampling pumps will be calibrated prior to sampling. Approximately 10 air samples will be collected at each pit (approximately seven downwind and three upwind). Downwind samples will be collected at various distances from the test pits. The specific sampling procedure for the air samples collected from near the test pits is detailed in "Atmospheric Sampling for Volatile Organic Compounds" in Appendix B of the SAP. The samples will be analyzed by EPA method TO1, which is specified in the SAS Request Forms found in Appendix B of the QAPP.

3.6 GROUNDWATER INVESTIGATION

3.6.1 NEW MONITORING WELLS

3.6.1.1 Locations of Groundwater Investigation Well Nests

The primary objectives of the Phase II groundwater investigation are to better define the lateral and vertical extent of the groundwater contaminant plume, to better define the local geology and hydrogeology of the study area, and to provide information that can be used in groundwater modeling, in risk assessment, and for evaluating potential remedial alternatives.

These objectives apply primarily to the Phase I study area south of Harrison Avenue. North of Harrison, few residents are or were supplied by private wells. Consequently, the primary objective of the Phase II study in this area is to define whether and how contaminants migrate toward the site from identified sources within this area.

The wells will be screened at different depths at a given location to provide vertical profiles of contaminant concentrations at the location, from near the water table to depths as great as 330 feet below the water table (350 feet below ground surface). In the western portion of the study area, the maximum depth of contamination is not known, while in the eastern part it extends at least 70 feet into the bedrock aquifer (and up to 140 feet below ground surface).

The rationale for the locations of proposed Phase II groundwater investigation well nests is presented in Table 3-3; the well locations for both groundwater and source investigations are shown on Drawing 1 (locations MW112 through 141 inclusive). In addition to the 17 wells shown in Table 3-3, wells MW101D and MW103D, installed by the U.S. Geological Survey during October 1992 for February 1993 and overseen by CDM, are considered groundwater investigation wells.

TABLE 3-3

RATIONALE FOR PHASE II MONITORING WELLS LOCATIONS - GROUNDWATER INVESTIGATION

Well Number	Location	Number and Depth of Wells	Rationale
MW101C	Existing well nest MW101	One well at approx. 172 ft.	Install intermediate-depth well (existing wells are at 88, 151 and 202 feet) to characterize bedrock contaminant plume at a location exhibiting the highest TCA concentrations (12,000 ppb in MW101B) observed in Phase I groundwater samples.
MW109D	Existing well nest MW109	One well at approx. 45 ft.	Install a well in known interval of high permeability at top of bedrock. This well will help to assess the effect of such a zone on the migration of contaminants.
MW112	North of potential source area 7, just south of creek, and 900 feet ESE of MW105	Three wells at approx. 57, 135, and 350 ft.	Located between the two large areas of groundwater contamination defined in Phase I, the four upper wells will allow determination of whether the two contaminated areas are connected. The deep well of this nest will be installed in the St. Peter Sandstone, in order to provide a measure of hydraulic head in this aquifer in the eastern part of the study area.
MW113	Near ISWS well MW28	Two wells at approx. 150 and 230 ft.	Evaluate vertical extent of contaminant plume below screened depth of ISWS wells MW28 and MW18. Lower boundary of the contaminant plume is unknown in this area.

TABLE 3-3

RATIONALE FOR PHASE II MONITORING WELLS LOCATIONS - GROUNDWATER INVESTIGATION

Well Number	Location	Number and Depth of Wells	Rationale
MW114	Existing ISWS wells MW16 and MW31	Two wells at approx. 150 and 230 ft.	Evaluate vertical extent of contaminant plume below screened depth of MW16 and MW31. Lower boundary of contaminant plume is unknown in the western part of this plume.
MW115	On 25th Street north of Harrison Avenue	Two wells at approx. 70 and 115 ft.	Determine whether contamination exists in unknown (potentially background) area upgradient of known contamination. Provide geologic and hydrogeologic data for groundwater modelling. Serve as potential background location.
MW116	23rd Avenue and 4th Street	Two wells at approx. 80 and 170 ft.	Determine contaminant concentration near northwest extent of known contaminated area. Provide geologic and hydrogeologic data for groundwater modelling.
MW117	Near Rock River at Chapman and Brooke Roads	Three wells at approx. 40, 90, and 160 ft.	Determine vertical extent of contamination near downgradient extent of contaminant plume. Determine potential contaminant inputs to the Rock River. Evaluate vertical hydraulic gradients.

TABLE 3-3

RATIONALE FOR PHASE II MONITORING WELLS LOCATIONS - GROUNDWATER INVESTIGATION

Well Number	Location	Number and Depth of Wells	Rationale
MW118	Existing ISWS wells MW9 and 29, and municipal well UW35	One well at approx. 110 ft.	Provide contaminant monitoring point at depth not currently monitored. At this location, pumping of UW35 before its shutoff drew in contamination; the resumption of pumping at UW35 may draw in contaminants again.

In general, proposed well locations for the groundwater investigation are designed to fill in the gaps where contaminant concentrations, geology and hydrogeology are poorly known. Existing well coverage is sparse in the portions of the study area east of 24th Street, as well as the area north of Harrison Avenue which was recently added to the study area. In the latter area, few residential wells have existed, and the few that did have now been connected to municipal water supplies.

The city's Unit Well 7 drew water from the unconsolidated aquifer, while other wells, such as Unit Well 16, draw water from deeper bedrock aquifers. Therefore it is important to determine both the pattern of contamination with depth as well as the potential for future effects on deep municipal supplies at well UW16.

East of 24th Street, the main contaminant plume shows relatively high contaminant concentrations (greater than 1,000 ppb of TCA), but the outlines and source(s) of contamination are not well defined. Much of the source identification task will be accomplished by the soil gas, soil boring and monitoring well installation work described above for the source investigation (subsection 3.5); however, additional monitoring wells and groundwater samples are necessary to verify the source identifications provided by the source investigation.

West of 24th Street, approximately 40 Illinois State Water Survey wells provide effective geographic coverage of the plume, but the vertical extent of the plume is unknown. At MW101 near 24th Street, contaminant concentrations increase rapidly with depth. Deep well MW101B had 12 ppm of TCA in Phase I while shallow well MW101A contained only 710 ppb of TCA. West of this location, however, there are no monitoring wells as deep as MW101B, and the pattern of contamination with depth is not known. The topic is of concern for several reasons: 1) Municipal Unit Well 35 (UW35) is located at a depth much greater than existing monitoring wells, and the recent resumption of pumping at UW35 will probably again draw in contaminants (both laterally and downward); 2) several other municipal wells in the study area are set in deep aquifers; and 3) the vertical pattern of contamination is important to define for the purposes of aquifer cleanup. As a result, west of 24th Street the new monitoring wells for the groundwater investigation will be installed largely to define vertical contaminant patterns, with most new wells being installed at greater depths than existing wells.

Though the source investigation and groundwater investigation are discussed separately, it should be noted that the functions of the two investigations are related. For instance, the monitoring wells installed under the source investigation will also be useful for the groundwater investigation in defining geologic and hydrogeologic conditions at various locations. In a similar manner, wells installed under the groundwater investigation can be useful for the source investigation, because observed patterns of contaminant pathways and fingerprints can frequently be related to specific sources of contamination.

In order to provide information on the local geology and groundwater flow, wells will be screened at various depths within a well nest to allow an evaluation of vertical hydraulic gradients and interconnectivity of aquifers. The number of wells in each well nest will depend on depth to bedrock, depth to the water table, and presence of clay or silt layers which may act as aquitards. Water levels at the various well nest locations across the site will allow lateral definition of the water table surface and quantitative evaluation of horizontal hydraulic gradients and contaminant transport directions.

In the groundwater investigation, one well from each nest will be screened immediately above the bedrock surface, one will be screened with the top of screen at 2-3 feet below the water table, and the remainder of the wells in each nest will be screened at intervals of approximately 30 to 70 feet (base of screen to base of screen) within the aquifer, or between aquitards, if present. Where bedrock is present at shallow depths, one or more wells will be installed in the bedrock aquifer(s). In addition to providing hydraulic gradient data, the distribution of well screens at a single well nest is intended to allow an analysis of vertical distribution of contaminants among aquifers and within each aquifer. Well screen placement will be determined in the field, based on the hydrogeologist's evaluation of the subsurface units as represented by the subsurface soil samples. The expected number of monitoring wells to be installed in each well nest is listed in Table 3-3.

3.6.1.2 Drilling Methods for Source and Groundwater Investigations

Hollow-stem augers will be used to drill as many boreholes as is technically and economically feasible. When this drilling method becomes impracticable due to presence of heaving sands or due to difficult drilling because of great depth (greater than about 125 feet), boreholes will be drilled using the mud-rotary method. This method is expected to be required for wells installed in the western portion of the study area where depth to bedrock is at least 200 feet. At locations where drilling will continue into the bedrock, the bedrock portion of the borehole will be drilled using the air-rotary drilling method. Except as noted below, the boreholes will be drilled with a minimum diameter of 6 inches, in order to allow an annular space of 2 inches between the 2-inch I.D. Type 304 stainless steel riser pipe and the wall of the borehole. Analytical, geotechnical and lithologic soil samples will be collected from the deepest borehole in each well nest as discussed in subsection 3.6.1.3, unless sampling from a more shallow borehole would expedite the field effort.

At locations where both the unconsolidated units and the bedrock are saturated, a 6-inch (inside-diameter) outer casing will be installed in boreholes that penetrate the bedrock, in order to minimize interaquifer flow within the borehole. Such locations will require the borehole diameter to be approximately 7 to 9 inches, in order to admit the 6-inch casing. When bedrock is reached at these locations, the 6-inch casing will be installed and the annular space sealed with a high-solids bentonite grout (e.g. Volclay). Drilling into the bedrock will then proceed by air-rotary methods. Small amounts of water may be added to the air in order to facilitate lifting the cuttings out of the borehole. No other fluids will be permitted, unless drilling proves ineffective without such fluids.

3.6.1.3 Subsurface Soil Samples For Source and Groundwater Investigations

Subsurface soil samples will be collected from source investigation wells and borings, test pits, and from groundwater investigation wells. The purpose of source investigation borings is to provide soil samples to determine the presence of contaminants in the soil which would act as sources of contamination to the contaminant plume at the site. Therefore the locations of these borings will be determined from the results of the Phase I and Phase II soil gas surveys, as well as any geophysical work (such as in Area 7). Subsurface soil samples will be collected for analytical, geotechnical and lithologic purposes. At borings and wells these samples will be collected with a split-spoon sampler in accordance with ASTM standards; at test pits the samples will be collected with the backhoe bucket. The sampling interval will generally be five feet for source investigation wells and borings, and 10 feet for groundwater investigation wells. At one or two locations, continuous sampling will be conducted in order to provide more complete stratigraphic information. Sampling intervals for specific wells and borings are provided in Table 5-2 of the Sampling and Analysis Plan (SAP). If possible, the soil samples will be collected from the deepest borehole of each well nest. The following paragraphs detail the purpose and the frequency of the analytical, geotechnical and lithologic samples to be collected.

Analytical Samples: The objectives of analyzing subsurface soil samples are: 1) to define soil contamination near or at potential source areas (for source investigation wells and borings and for test pits); 2) to determine background soil chemical characteristics away from source areas; and 3) provide information about contaminant partitioning between the groundwater and soil media, which is in turn important to define in assessing both contaminant plume migration and remediation alternatives. Samples that will fulfill the latter objective include samples from wells and borings located near potential sources, and wells located farther from potential sources but still within the plume. Soil samples from wells located outside the contaminant plume will allow characterization of background chemical constituents in the study area.

For subsurface borings (all are located near potential source areas), the subsurface samples will be collected at five-foot intervals, and from the unsaturated zone only. Samples will be screened for VOC concentrations by the headspace method using an HNu photoionization detector or an OVM flame ionization detector, as discussed in subsection 5.4 of the SAP. Two samples from each soil boring will be selected for laboratory analysis of Target Compound List (TCL) organics and Target Analyte List (TAL) inorganics: the sample with highest VOC concentrations as measured by headspace, and the first sample below the contaminated zone that shows undetectable VOCs by headspace. The rationale for the selection of these samples is that they will provide general upper and lower bounds for VOC concentrations in each soil boring. The other subsurface samples from each boring (containing intermediate headspace values) can then be assumed to contain VOC soil concentrations between the upper and lower bounds indicated by the laboratory analysis.

For monitoring wells installed for both the source investigation and the groundwater investigation, the subsurface samples will generally be collected from the deepest well at each nest at five- and 10-foot intervals, respectively. However, subsurface soil samples will be submitted for laboratory analysis from only approximately 20% of Phase II wells (10 locations); of the monitoring wells from which soil samples will be submitted, approximately three samples will be submitted from each well, and samples will be from the saturated zone only. The specific wells to be sampled for analytical purposes will be selected in order to provide data representative of the study area. At each monitoring well sampling location, the samples to be submitted for analysis will be one sample from the screened interval, if possible, and approximately two samples from unconsolidated stratigraphic units different from the screened interval sample. Analyses to be performed on these samples are TCL organics, TAL inorganics, and total organic carbon. The total organic carbon analysis will allow estimation of the partitioning preference of contaminants between the groundwater and the solid materials of the aquifer.

At test pits, subsurface soil samples will be collected with the backhoe bucket. Each bucket will be scanned for VOCs using an HNu, OVM or equivalent, and the contents will be characterized visually. Approximately four samples will be collected from each test pit. Sample selection will be based primarily upon visual characteristics (i.e., soils saturated with product will be selected for analysis), and secondarily upon VOC concentrations (the samples with the highest VOC concentrations will be selected). If four samples cannot be selected from a test pit by visual or VOC screening methods, samples will be selected based on geographic coverage, with samples being collected from different portions of the test pit. The analyses to be performed on these samples are TCL organics and TAL inorganics. The two most contaminated samples (based on screening characteristics) will also be submitted for analysis of TCLP organic and inorganic parameters. Both the excavation and sampling of test pits will be conducted by subcontractor crews overseen by CDM.

Geotechnical Samples: Two subsurface soil samples will be submitted for grain-size analysis from the saturated zone of each of the wells sampled for analytical purposes (discussed above and listed in subsection 5.5 of the SAP). As with the samples selected for analytical purposes, the samples for grain-size analysis will be selected to be representative of the lateral and vertical variations in the unconsolidated stratigraphic units across the study area. Where possible, one of the two samples will be from the screened interval. The purpose of submitting the grain-size samples is to assess the proportion of clay-sized materials available for adsorption of organics in the site aquifers, and to assist in the analysis of hydraulic conductivity of the aquifers.

Lithologic Samples: Lithologic samples will be collected for the purpose of determining and describing the geologic materials present at depth. The lithologic samples will be visually inspected and classified by CDM's onsite geologist. In practice, all subsurface soil samples will be used for lithologic purposes. As noted above, the sample intervals will generally be five feet for source investigation wells and borings, ten feet for groundwater investigation wells, one foot for cuttings samples of bedrock intervals (discussed below), and continuous sampling at one or two locations. Sampling intervals for specific wells are given in Table 5-2 of the SAP. The lithologic samples will be used to gain a clear understanding of the nature of the materials present at depth, to aid description of geologic materials penetrated by the boreholes, to assist in stratigraphic correlation of clay deposits, and to define preferential pathways of groundwater (and contaminant) migration.

In the bedrock portion of boreholes that penetrate bedrock, split-spoon sampling will not be possible. However, samples of the bedrock cuttings will be collected as they emerge from the borehole, at a frequency of one sample per foot. The onsite geologist will examine and log these cuttings for lithologic purposes.

3.6.1.4 Groundwater Samples Collected During Drilling

In order to determine the optimal depth interval at which to set the monitoring well screen, groundwater samples will be collected for vertical profiling purposes at 10-foot intervals during drilling at selected monitoring well locations (in both source and groundwater investigations). These samples will be submitted to a local laboratory subcontracted to CDM for 24-hour GC analysis of halogenated VOCs. Upon receipt of the analytical results, the field geologist will determine the depth interval at which the monitoring well screen will be set. The depth interval will generally be centered on the depth of the sample with the highest contaminant concentrations reported for the particular drilling location. At several locations (MW113 and MW114), however, groundwater samples will be collected to also determine the maximum depth penetration of contaminants in the aquifer system. At these locations, the well screen of the deep monitoring well will be set at the deepest contaminated interval.

Collection and analysis of vertical profiling groundwater samples will allow elimination of one or more monitoring wells at certain well nest locations, and allow monitoring to focus on the specific depth of peak contaminant concentrations (or, in the case of MW113 and MW114, the maximum depth of contamination). The collection of vertical profiling groundwater samples will generally be limited to drilling locations which are: 1) more than 500 feet from potential contaminant source areas; and 2) in areas where the pattern of contamination with depth is unknown. The monitoring well locations to be sampled for groundwater during drilling are MW112, MW113, MW114, and MW119 through MW124.

These locations were selected because the depth of peak contaminant concentration is unknown in these areas.

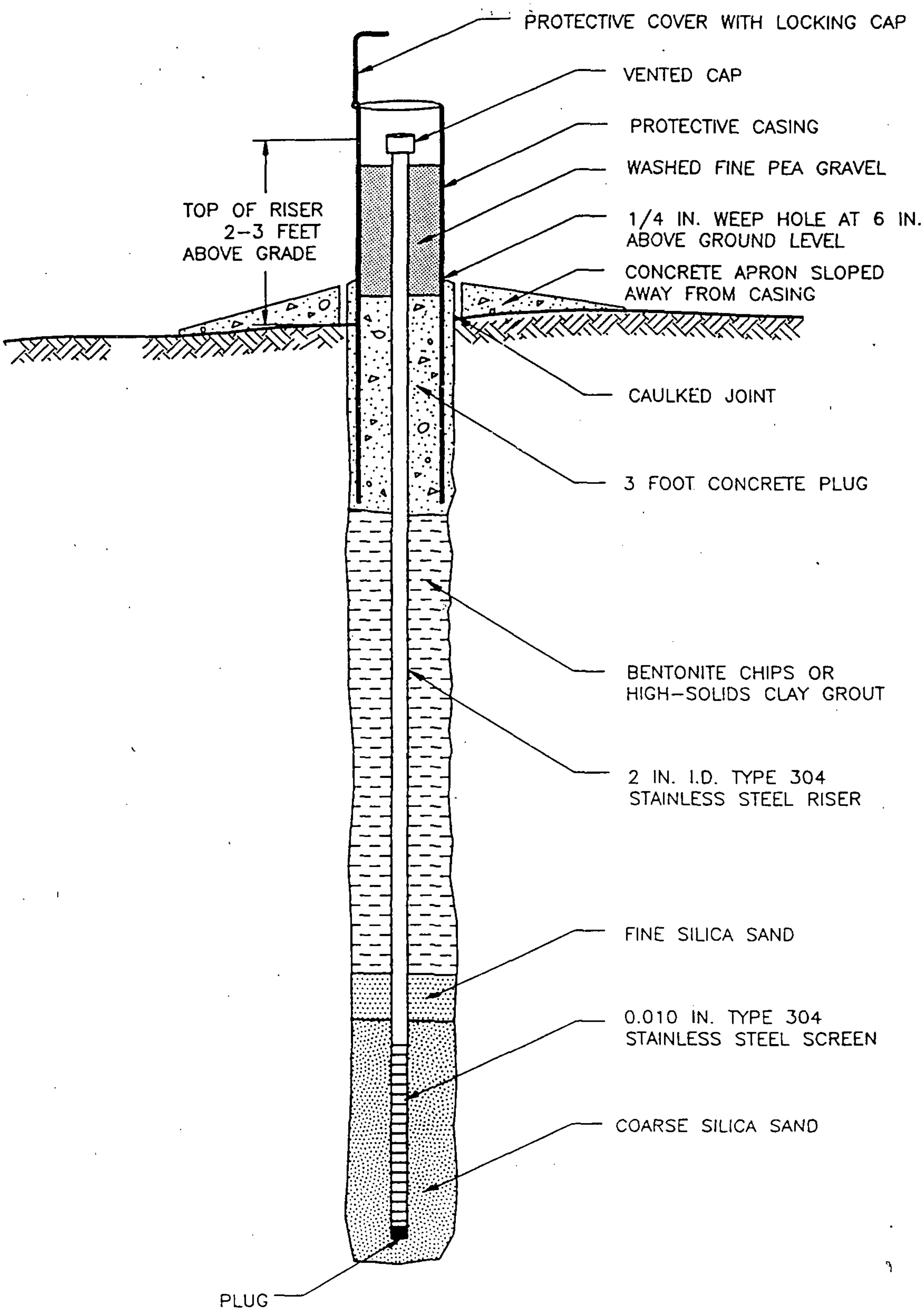
Collection of vertical profiling groundwater samples during drilling will require two different collection methods, based on whether the aquifer material is unconsolidated or bedrock. In the unconsolidated aquifer, groundwater can be sampled by the use of a Hydropunch or similar sampler that can be driven from the base of the borehole into virgin aquifer material. In the bedrock, such a method will not be possible, however. Bedrock intervals will be sampled by inserting a pump and packer assembly approximately five feet above the bottom of the boring. Sampling can be conducted in the open borehole in certain bedrock wells because the air-rotary drilling methods used will employ no drilling fluids that might interfere with collection of a true in-situ sample of the groundwater.

3.6.1.5 Monitoring Well Installation - Source and Groundwater Investigations

Monitoring well construction is schematically illustrated in Figure 3-2. The wells for the source investigation and groundwater investigation will be constructed with 2-inch diameter riser pipes, well screens, vented caps, and bottom plugs made of Type 304 stainless steel. At bedrock wells where the unconsolidated (drift) unit is saturated, an additional outer casing of 6-inch I.D. will be installed. The 2-inch riser pipes will be flush-threaded, and joints will be wrapped with Teflon tape during installation to inhibit leakage. The well screens will be 10 feet long, and continuously wound, with a slot size of 0.010 inches.

The filter pack will be a silt-free silica sand (Wedron 390 or equivalent) which will be sized according to the well screens used and the formations the materials are screened in. The sand will be placed in the bottom-most foot of the borehole to form a pad to set the well on.

The well will then be emplaced, and the filter pack will be installed from the base of the screen to 2 to 3 feet above the top of the screen. A 1- to 2-foot thick fine silica sand filter



D:\168I\...\NPLN\ FIG3-1 06/23/92 B. SELIGA

SOUTHEAST ROCKFORD

SCHEMATIC WELL CONSTRUCTION DIAGRAM FOR MONITORING WELL

CDM
environmental engineers, scientists, planners, & management consultants

Figure No. 3-2

collar will be installed above the filter pack in order to prevent the bentonite seal from infiltrating the filter pack near the screen. A well seal of high-solids clay grout (e.g. VolClay^{R} grout, PureGold^{R} grout, etc.), or bentonite chips will then be placed from the top of the filter collar two to three feet below the ground surface. A high-solids clay grout will be the preferred well seal, but bentonite chips may be used in some shallow wells in order to expedite field activities. The grout will be tremmied into the annular space from the bottom, in order to prevent the formation of gaps in the well seal.

The remaining two to three feet of the borehole will be filled with concrete in which a protective well casing will be set. The protective well casing will be a minimum of 5 inches in diameter and equipped with a locking cap, which will maintain the integrity of the well.

The protective casing should be 5-6 feet in length, in order to allow the casing to extend 6 inches above the 2-3 foot stickup of the riser pipe. The outer casing will have two 1/4-inch holes drilled approximately 6 inches above ground level, to prevent the outer casing from filling with water. The outer casing will be filled with washed pea gravel to 6 inches below the top of the riser pipe.

A 2-foot diameter concrete apron will be installed at the ground surface around the outer casing. The concrete apron will be sloped radially away from the well to facilitate surface drainage. If necessary, other measures will be taken to eliminate the possibility of surface water ponding near the borehole. The concrete apron will be separated from the concrete plug in which the protective casing is set by a caulked joint in order to minimize the effects of frost heave. Six-foot steel bumper posts will be set in concrete around the well nests, in order to prevent damage to the wells from vehicles. In order to gain access for some drilling locations on private property, it may be necessary to modify the above-ground components of the well in the field, such as using flush-mounted wells and eliminating the bumper posts. Such modifications will be made only at the IEPA's request.

3.6.1.6 Hydraulic Conductivity Tests - Source and Groundwater Investigations

In order to quantitatively evaluate groundwater flow velocities and contaminant transport rates, it is critical to determine the hydraulic conductivities of the aquifers of the site. Hydraulic conductivities will be measured for each of the wells installed during the Phase II investigation by performing hydraulic conductivity tests. The preferred test method will be a slug test, where either air pressure or a physical slug will be used to instantaneously change water levels in the wells. The recovery of the water level in each well to the pre-test level will be recorded at least three times, and the records will be analyzed using the method of Hvorslev and/or the method of Bouwer and Rice (Water Resources Research vol. 12 (1976): 423-28) to quantitatively estimate hydraulic conductivity.

An additional hydraulic test proposed for Phase II will be to conduct a small recovery test at several existing wells located near municipal well UW16, when the latter well is shut off by the city for 24 to 48 hours. The municipal well is screened in the St. Peter and underlying sandstones, while the nearby Sundstrand monitoring wells are open to the overlying Galena Group. The test will consist of measuring water levels in the Galena Group wells, in order to assess the vertical hydraulic connection between the Galena and the St. Peter and underlying sandstone units. Available data indicates that there is a considerable hydraulic head difference (directed downward) between the Galena Group and underlying units. This head difference is likely caused by the presence of an intervening low-conductivity layer (perhaps part of the Platteville Group or the Glenwood Formation) that retards vertical groundwater movement across it. The proposed recovery test would allow assessment of the hydraulic effects of such a low-conductivity layer. Such an assessment is important in modelling the groundwater flow system, as well as in evaluating the threat of contamination to the deep municipal sources of groundwater.

3.6.1.7 Well Surveying - Source and Groundwater Investigations

To determine well elevations with respect to mean sea level, elevations of the tops of the ground surface adjacent to each well, and of the riser pipe of each well installed during the Phase II investigation will be surveyed by a qualified surveyor subcontracted to CDM. The surveyed wells will be tied in with the USGS bench marks located in the study area, and will be surveyed to a vertical tolerance of plus or minus one-hundredth of a foot. In addition to elevations, horizontal locations will be surveyed to the nearest tenth of a foot; these locations will be tied in with the state-plane coordinate system.

3.6.1.8 Water Level Measurements - Source and Groundwater Investigations

Static water levels in all wells installed in the Phase I and II investigations plus selected wells from previous investigations will be measured after the wells have been developed and have been given sufficient time to stabilize. The water levels will be measured to an accuracy of 0.01 feet and will be taken on the same day, if possible, to minimize any water level changes which may occur as a result of precipitation, changes in barometric pressure, or other natural fluctuations.

Following completion of the first round of static water level measurements, a second round of measurements will be conducted; this survey data will allow development of piezometric surface maps of the aquifers. Also, the data will be used to evaluate vertical hydraulic gradients within well nests, and to assess hydraulic connections between aquifers.

3.6.1.9 Useability Evaluation of Well Nest MW111

During the Phase II study, CDM will evaluate the useability of the monitoring well nest MW111, which was installed on the right-of-way on American Road during the Phase I groundwater investigation. The three wells at this location were converted from stick-up wells to flush-mount wells in October 1992 by Fishe Enterprises, Inc. of Cherry Valley, Illinois. CDM attempted to locate the converted wells in November 1992 but was not able to because of the presence of building construction equipment and materials. In addition, the ground surface at location MW111 was covered by new soil, and it is likely that the flush-mount assemblies are buried beneath this soil.

The useability of the converted wells at MW111 will be evaluated by:

1) Requesting from Fishe Enterprises a detailed, written description of the well conversion process. This description will be evaluated by CDM to assure that proper conversion procedure was followed. Fishe Enterprises will be asked to assist in locating the converted wells.

2) Visually inspecting and photographing the converted wells. The inspection will assess factors such as the security of the wells, the cleanliness of the flush-mount assemblies and the interior of the riser pipe, the potential for surface water to enter the wells, and the general construction quality of the wells.

3) Lowering a bailer to assess the plumbness of each well. The plumbness of the wells will help indicate whether they were damaged during the conversion process.

3.6.2 GROUNDWATER SAMPLES - SOURCE AND GROUNDWATER INVESTIGATIONS

Groundwater samples will be collected from each of the monitoring wells installed during Phases I and II of the investigation, and from approximately 21 Illinois State Water Survey wells and 19 industrial wells. In addition, 25 residential wells will be sampled in Phase II. The residential well sampling effort is discussed below in subsection 3.6.3.

Groundwater samples secured from Phase I wells, Phase II groundwater investigation wells, ISWS wells, industrial wells and private wells will be analyzed for VOCs. Samples from Phase II source investigation wells will be sampled for TCL organics and TAL inorganics. These are the classes of compounds expected to be present based on existing data and source information. Because groundwater is currently used as a potable water source in the area, lower detection limits will be required for VOCs to allow a comparison with drinking water standards. Selected wells (20% of all wells to be sampled; the selected wells will be representative of the contaminant plumes in the various aquifers) will be analyzed for general water chemistry parameters including minerals (alkalinity, fluoride, chloride, sulfate, and silica), nutrients (COD, ammonia, total kjeldahl nitrogen, nitrate, nitrite, total phosphorus and TOC), as well as total dissolved solids and total suspended solids, for remedial design purposes. These parameters are useful in evaluating most conventional remedial treatment methods for contaminated groundwater, including air stripping, carbon adsorption, bioremediation, and chemical treatment methods.

The monitoring wells will be purged a minimum of three well volumes using a positive displacement pump constructed of chemically inert materials. The groundwater samples will be obtained using a decontaminated stainless steel or Teflon bailer, or using a positive-displacement bladder pump designed for sampling purposes. Groundwater sampling procedures are described in more detail in subsection 5.7 of the SAP.

3.6.3 RESIDENTIAL WELL SAMPLING

The residential wells to be sampled in Phase II are a subset of those previously sampled during the Operable Unit study during 1990. The wells to be sampled are those that were located outside of the area where municipal water connections were determined to be necessary. Based on the Operable Unit study, residences within the area defined as exceeding MCLs plus a buffer zone were connected to municipal water supplies. The objective of Phase II residential well sampling is to determine whether the contaminant plume has expanded beyond the previous boundaries defined by the Operable Unit data to areas underlying any of the residences that were not connected. Twenty-five residential wells will be sampled; the specific wells to be sampled are listed in Table 5-4 of the SAP.

Public water supply connections for homes within the affected area (including those areas within the MCL boundaries for target compounds, plus a buffer zone) are now complete. A temporary granular activated carbon treatment system has been installed to treat the contaminated groundwater pumped at municipal well UW35. Pumping was resumed at this well in spring 1992, and the well now contributes to the water supply for most of the affected residences.

3.6.4 RESIDENTIAL AIR SAMPLING

Based on the Phase I data, there exists the potential for VOC vapors to migrate upward from the upper part of the saturated zone, through the vadose zone and into confined residential spaces, particularly basements. Therefore, air monitoring will be performed in 14 residential basements, 12 of them located in identified areas of high contamination in the shallow part of the aquifer system. The data from the analysis may be used in risk assessment.

The overall goal of the air sampling program is to establish the extent of exposure to volatile organics for the residents living near contaminant source areas. To accomplish this goal, the soil gas migration pathway will be characterized and the routes of exposure will be identified. The monitoring program results will establish the need for remedial activities. Potential remedial actions include but are not limited to basement ventilation and basement sealing.

The procedures for collecting and analyzing the environmental samples are included in the sampling and analysis plan (SAP).

3.6.4.1 Indoor Air Sampling

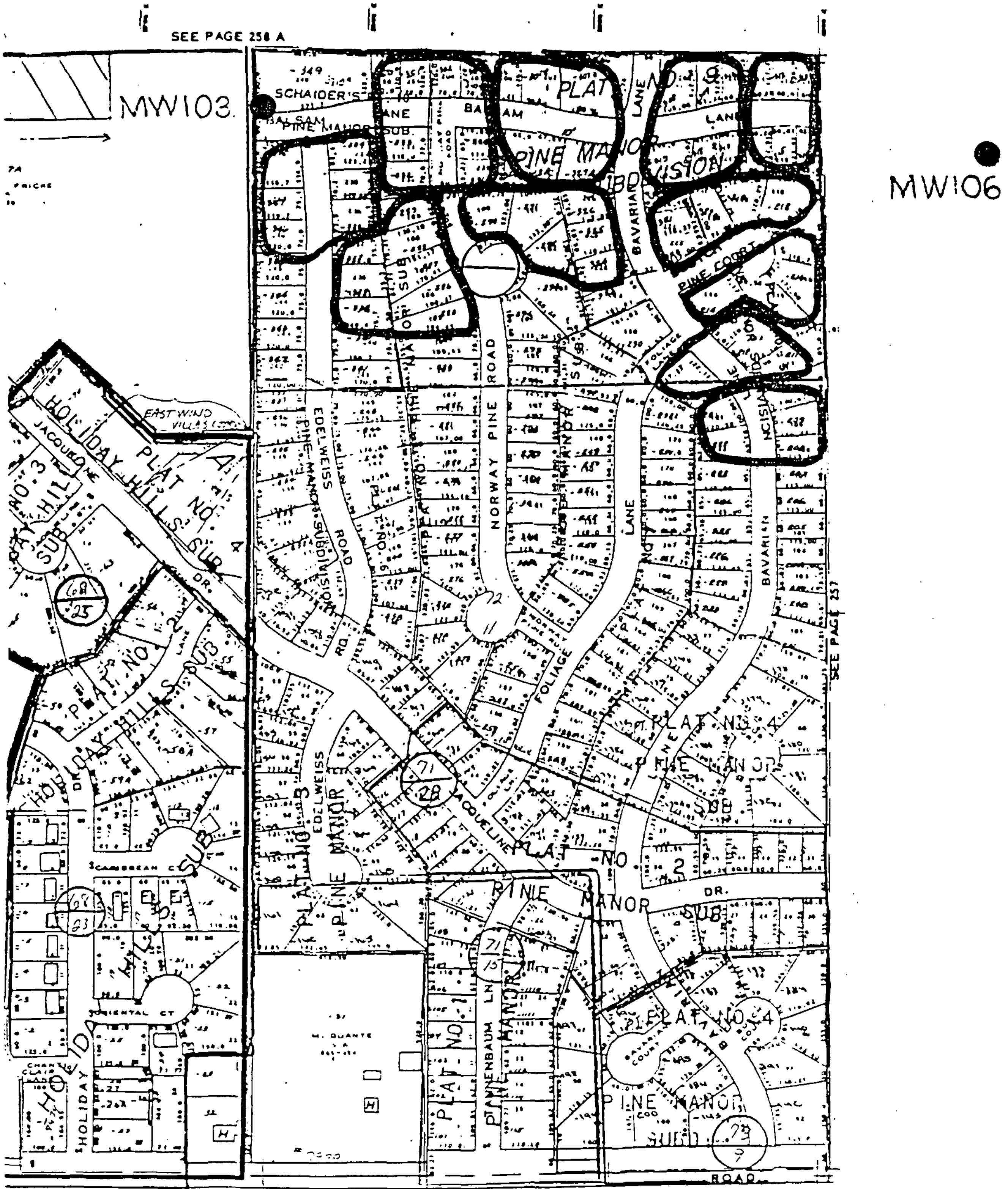
In the selected area for residential air sampling, 14 residences will be sampled. As shown on Figure 3-3, 12 clusters of approximately five homes each have been selected within the plume area. Two additional background residences will be selected in an area where groundwater contamination is known to be negligible. The IEPA Community Relations team will narrow each cluster to one residence based on their capabilities to obtain permission from residents.

For each of the residential locations selected, it is proposed that two air samples be collected, one from the breathing zone in the basement and one of ambient air collected adjacent to the residence. The samples will be collected over a 24-hour period using a Summa canister.

One of the objectives of the air quality survey is to determine if residents may be exposed to VOCs from either the soil gas pathway or from ambient air influx from outdoors to indoors.

The basement of each residence will be sampled for volatile organics. To determine whether VOCs from soil gas or ambient air are exposing individuals, the concentration of the contaminants need to be determined at the point of exposure, the breathing zone. Sources of volatile organics within the residence that are independent of subsurface contamination, such as polyvinyl chloride products, may interfere with analytical results. Therefore, specific indoor sampling locations will be determined following inspection of the basement. However, samples will generally be located in living space areas that would have the highest exposure potential.

A minimum of two background residences will be selected for air quality sampling to determine in-home background levels of volatile organics. The residences will be selected such that influences from site contaminants (chlorinated volatile organics) are not expected. The procedure to collect background samples will be the same as described in the SAP for the residential air sampling.



SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY

RESIDENTIAL AIR SAMPLING GROUPS

CDM

environmental engineers, scientists, planners, & management consultants

Figure No. 3-3

3.6.4.2 Ambient Air Sampling

An ambient air sample from outside each residence will be collected simultaneously with the indoor air sample to determine the VOC concentrations immediately outside the residence. As described in the SAP, both the ambient air and indoor air samples will be collected over a 24-hour period with a 15-liter Summa canister. The analysis to be performed on the air samples will include volatile organics by EPA Method TO-14 as described in the SAP.

3.7 STORAGE AND DISPOSAL OF RI-GENERATED WASTES

The drilling and sampling activities of the Phase II investigation are expected to generate liquid and solid wastes. Solid wastes, including soil, drill cuttings, personal protective equipment, and other incidental wastes will be sealed in 55-gallon drums and placed in a central, secure drum storage area. IEPA will be responsible for selecting the location of and securing access for the drum storage area as well as for ensuring that the area is secured prior to drum removal.

CDM's drilling subcontractor will be responsible for the proper sampling and disposal of the drums on a regular basis. It is expected that the drums will be removed at a rate of once per month or when 75 drums have accumulated. CDM will provide oversight during drum removal and IEPA will be responsible for all manifesting of the drums.

3.8 DECONTAMINATION PROCEDURE

Decontamination procedures for personnel are fully described in the Health and Safety Plan. Equipment decontamination procedures are briefly summarized in this section.

Decontamination of large equipment (drill rigs, well materials, and associated equipment) will be performed at a decontamination pad lined with impermeable sheeting which drains to a shallow sump. Decontamination will consist of high-pressure steam cleaning and scrubbing, as necessary. Decontaminated equipment will be stored on plastic sheeting or aluminum foil and kept from coming in contact with the ground surface and other potentially contaminated materials.

Sampling equipment, including split-spoon samplers, bailers, reusable spatulas, and any other implements which may come in contact with the samples or the wells will be decontaminated by scrubbing with a dilute trisodium phosphate solution, followed by a tap water rinse, and a final deionized water rinse. Decontaminated equipment will be placed on or wrapped in clean tin foil prior to next use. All field equipment will be thoroughly decontaminated prior to initiation of and at completion of Phase II field activities.

3.9 DATA VALIDATION, ASSESSMENT, AND COMPILATION

CDM will perform data assessment activities for all data generated during the RI to ensure that the data is sufficient to support the risk assessment and the feasibility study that will be performed as part of the Phase II investigation. Twenty-five percent of the analytical data analyzed through the USEPA CLP will be validated by CDM.

Initial data validation will be conducted by the USEPA CLP to determine if the data meets contract requirements as specified by the IFBs/SOWs for organic and inorganic analyses. CDM will validate 25 percent of the data received from the CLP to determine whether it meets the requirements of the QAPP. Data validation activities will be performed in accordance with current USEPA Contract Laboratory Program guidance. Factors to be considered in data validation include sample holding times, instrument tuning and performance, instrument calibration, blanks, surrogate recoveries, matrix spike/matrix spike duplicate analysis, and other quality control parameters. Samples chosen for validation will be the more critical samples such as background samples and samples from new monitoring wells. The additional data to be validated will be chosen at random from various data sets. If quality problems are encountered within a data set, the remainder of the data set will be validated. This additional validation has not been included in the cost estimate and would be considered out of scope.

The specifications provided in the guidelines and/or acceptance criteria given by the USEPA Central Regional Laboratory QA Section will be followed when performing data validation. It is assumed that two hours of labor per organic sample data set and one hour per inorganic sample data set will be required for data validation.

Data assessment will be performed upon completion of data validation activities. The assessment will be based on all new data and existing data determined to be consistent with the goals of the investigation. Data will be evaluated as it compares to project objectives and summarized into a logical, useable format for data manipulation and interpretation.

3.10 <u>RISK ASSESSMENT</u>

The objective of the risk assessment to be performed during Phase II of the Southeast Rockford Groundwater Contamination Project is to assess the potential impacts on public health, welfare, or the environment from actual or potential releases to the groundwater in the study area. The primary objective of the baseline risk assessment will be to evaluate the groundwater in the study area in the absence of remediation. CDM will also evaluate potential impacts on indoor air quality in residential areas where contaminants are present in near-surface groundwater at part per million levels. In addition, if the conclusions of the baseline assessment indicate that remediation is necessary, CDM will evaluate the effectiveness of the remedial alternatives considered in reducing impacts on public health or the environment. The risk assessment will be divided into four main components:

- Contaminant identification;
- Exposure assessment;

- Toxicity assessment; and

- Risk characterization.

The risk assessment process will be conducted using procedures consistent with USEPA guidelines for risk assessments (Risk Assessment Guidance for Superfund, 1989). The contaminants posing the greatest potential risk will be selected from consideration of the results of the groundwater and air sampling performed during Phase I and Phase II of the RI, as well as a knowledge of the study area history. All relevant exposure pathways will then be evaluated under both current and future site-use conditions; the quantitative risks associated with those pathways will be estimated separately. In addition, the concentrations of contaminants found will be compared to applicable or relevant and appropriate requirements (ARARs).

Based on the existing information and site background, contaminants of concern in the groundwater are expected to be limited to chlorinated VOCs. The most significant exposures are expected to be associated with ingestion of contaminated groundwater at private wells, although inhalation and dermal contact with VOCs during household water use may also be associated with significant risks.

Additionally, CDM will evaluate the limited soils data gathered from the source screening investigation by conducting a qualitative risk evaluation. Concentrations of chemicals detected in soils will be compared to available ARARs and viable exposure pathways will be identified.

3.11 GROUNDWATER MODELLING

CDM proposes to use a groundwater model as a tool for extracting information from the Southeast Rockford study to help make technically sound planning and design decisions. The model will provide a means to organize, integrate and visualize available data to test hypotheses regarding groundwater flow paths and transport mechanisms, and to make predictions of future conditions.

The Phase II modeling activities will be based on the preliminary model developed as part of the Phase I investigation. Phase I modelling activities involved the preparation of a numerical model of site hydraulics and the analysis of contamination data collected by CDM and IEPA.

The initial model encompassed all areas of investigation and utilized data collected during the Operable Unit and Phase I field activities. The objectives of modelling in Phase I were to:

- initiate model development
- visualize the existing conceptual model of site stratigraphy
- provide a framework to organize and visualize site data
- identify additional data collection needs.

Data analysis involved the development of a groundwater contamination database and the generation of graphics to visualize the extent and nature of the existing contaminant plumes.

The Phase II modelling effort will be based on the end product of the Phase I model. Site boundaries will be extended and the model will be applied to help identify contaminant sources and evaluate groundwater flow paths that impact the site. Additional potential uses for the model would be to support the risk assessment and evaluate remediation scenarios. The purposes of the model are described below. Costs for using the model to support risk assessment and to evaluate remediation scenarios have not been included in the total model cost estimate, as they are difficult to quantify at this time. These items could be added to the scope of work after evaluation of the Phase II data if determined to be necessary.

3.11.1 PURPOSE OF THE PHASE II MODEL

- Test Hypotheses Regarding Location and Timing of Contaminant Releases

  Complex three-dimensional aquifer systems such as the one at Southeast Rockford defy back-of-the-envelope analysis of the direction and rate of movement of spatially distributed contaminant releases. Uneven gradients, complex capture zones, and inhomogeneity in the vertical and horizontal directions make a simpler evaluation unreliable.

  Once a calibrated flow field has been developed, the migration of groundwater contaminants from various sources may be simulated. Contaminant transport simulations allow hypotheses related to the location and timing of contaminant releases to be tested for their ability to replicate the observed spatial and temporal distribution of groundwater contamination.

- Project Future Contaminant Concentrations to Support Risk Assessment Analysis

  Models are a good means of estimating future contaminant concentrations in complex aquifer systems. Groundwater transport simulations can provide concentration estimates at <u>any</u> point in the system for use in estimates of risk to the exposed public. This use of the model can be added to the scope at a later date if deemed necessary.

- Improve Remediation Design by Enabling Testing of Alternative Designs

  Models are able to simulate the hydraulic and contaminant transport effects of plume containment, extraction, injection and source elimination programs. Various remedial techniques can thereby be assessed and refined at a relatively low cost. This use of the model can be added to the scope at a later date if deemed necessary.

- Provide Effective Communication Tools

  Models help interested parties to visualize system behavior. Graphic images showing water table elevation, mass transport simulations, and site stratigraphy, for example, can convey to the public basic concepts related to groundwater flow and complex spatial relationships related to the study area.

3.11.2 MODELLING TASKS

The following modelling tasks have been identified to fulfill the objectives as stated above:

- **Review of Existing Data on Hydrogeology and Contamination**

  CDM has reviewed reports on regional hydrogeology and historical records related to piezometric head in the aquifer. Additionally, CDM has reviewed information on land use, facility history and disposal practices as discussed in subsection 3.5.1. Some additional data will be gathered for the expanded study area and to fill some of the gaps identified in Phase I. Data gaps include hydraulic head in the St. Peter Sandstone, and hydraulic heads in the western part of the study area in the Galena-Platteville groups and the deep part of the unconsolidated aquifer.

  The location and screened interval of municipal, industrial, and private residential wells in the region to be modelled will be incorporated into the model database. The production history of municipal and production wells in recent years (35 years, if possible) will be acquired and incorporated into the model database. Where pumping records are not available, pumping levels will be approximated as a function of pump capacities, observed drawdown and demand volume.

- **Data Management**

The Phase II Remedial Investigation work plan includes an extensive data collection program of groundwater and soil samples. Entry, manipulation, retrieval and display of groundwater and soil data is facilitated by use of database software for data storage.

The database must be implemented; components of the database are data file structures, input forms and standard reports. Data will be entered and checked for accuracy.

Tabulated output documenting data collection activities will be generated, as well as graphic images representing the vertical and horizontal distribution of contaminants. Graphic images will include:

- fingerprint plots, which show the relative concentration of several contaminants

- time histories of individual contaminants

- contaminant concentrations along aquifer cross-sections to show variation of concentrations with location and depth.

These graphic images will be used to illustrate contaminant migration patterns and in support of efforts to identify contaminant sources.

- **Develop Flow Model Within Newly Established Model Boundaries**

The extent of the preliminary model prepared in Phase I was the recently-expanded study area (extending north to Broadway). In Phase II the boundaries will be established based on natural features, such as rivers, groundwater divides, and the documented direction of groundwater flow. The boundaries will be at a sufficient distance from the area of interest, so that the sensitivity of flow patterns in this area are not impacted by uncertainties at the site boundaries.

A conceptual model of the expanded model coverage will be developed based on data collected. A conceptual model is simply a qualitative description of the aquifer and its behavior, including:

- significant stratigraphic units
- sources of groundwater including natural and artificial recharge and rivers
- sinks of groundwater including wells and rivers
- principal pathways and directions of groundwater flow.

The grid will be extended to the new site boundaries and model stratigraphy defined in accordance with the expanded conceptual model. This includes assignment of layer (stratigraphic unit) elevations at all grid points, hydraulic parameter values for each layer and element, boundary conditions, flux and recharge.

- **Calibrate Flow Model**

After the numerical model has been constructed, it will be tested and revised until it satisfactorily reproduces observed conditions. In addition to adjusting hydraulic parameter values, this testing process often forces revisions in the conceptual model and sometimes indicates that new data collection efforts should be undertaken. The Phase II investigation was designed to fill data gaps that were identified in Phase I. This new information will be used to build upon and refine the preliminary model.

A preliminary calibration of the flow model is required to begin development of the transport model. It is important to understand that work on development of the transport model is an iterative process and will almost certainly necessitate repeated reviews and modifications of the calibrated flow field.

An understanding of the sensitivity of the system to pumping rates, recharge, and hydraulic properties will be developed in the course of calibration. Specific issues to be addressed in the calibration of the flow field model are the effects of observed zones of high porosity in the dolomite, surface water-groundwater interactions near the Rock River, and the effect of industrial and municipal pumping on groundwater flow patterns.

- **Transport Model Development and Source Identification**

The transport model will be used to simulate the historical development of the existing plumes as a means of verifying the flow model and estimating contaminant transport parameters. Typically, some revisions to the flow model must be made during the course of transport model development. Transport parameters, such as retardation, porosity and contaminant decay rate may be modified as well. Calibration and transport model development are parallel tasks, with interim results from the contaminant transport model prompting additional calibration activities.

Ultimately, the model will be used to test consistency of suspected contaminant source areas with observed patterns of groundwater contamination. Eight potential source areas were identified during assessment of Phase I investigative work, and six additional potential source areas have been identified subsequent to Phase I (area 6 has since been eliminated as a potential source area). Since the location and timing of contaminant releases are not known with certainty, various source scenarios will be evaluated for their ability to replicate the existing spatial distribution of contamination. This evaluation of individual loading scenarios will proceed as follows:

Develop historical groundwater flow fields. Simulations of historical groundwater flow fields (over approximately 35 years) are needed as inputs to transient transport simulations which attempt to replicate the historical development of contaminant plumes. Groundwater flow patterns change over time due to changes in land use patterns, pumping rates and precipitation. Simulations of historical groundwater flow fields are made by assuming that the calibrated, steady state flow field correctly represents the system, and modifying the rates of recharge and pumping. That is, the steady state model will be used as a starting point for developing the historical flow fields by incorporating historical pumping and recharge rates. Recharge rates will be determined from available historical precipitation data.

Prior to Phase II, CDM has identified a number of potential sources based on the observed distribution of contaminants and USEPA 104E requests made of potential source facilities. Simulated contaminant release scenarios must be consistent with known historical land use patterns and disposal practices at these potential sources.

Source identification is obviously closely connected to data review activities. Ideally:

- data review guides modelers as to the location of potential sources and periods of possible contaminant releases

- historical simulations often direct field investigations to potential contaminant source areas not previously identified.

This process is often cyclical, with simulations highlighting the need for additional field work and the results of additional field work serving to motivate additional simulations.

Use transport/optimization codes to refine loading scenario. Based on the Phase II evaluation of potential source areas, including the observed contaminants and likely periods of release, the transport of dissolved contaminants in the groundwater will be simulated using DYNTRACK. The simulated timing and contaminant loading of the sources is adjusted to provide the best fit between simulated and measured contaminant concentrations at points of observation.

Plumes which appear to be derived from multiple sources present the greatest problems for source identification. In these cases, DYNOPT may be used to assist in the process of defining source strength, timing and location. DYNOPT is a program which uses optimization techniques to assist the modeler in estimating the relative contribution of different source locations and time periods in the development of the observed contaminant plume.

- **Evaluate Remediation/Control Alternatives**

  The transport model may be used for a preliminary screening of source control and plume control/extraction strategies. In this optional task, the model would be modified to represent remediation/extraction fluxes for each strategy and used to evaluate effectiveness based on time histories of mass removal, reduction of plume extent and reduction of contaminant concentrations at specific locations. The goal of evaluated strategies will be to mitigate negative impacts at the point(s) of exposure identified in the risk assessment analysis.

3.11.3 MODELLING TOOLS

CDM's DYNSYSTEM groundwater modelling programs will be used for this study. This is a comprehensive set of state-of-the-art programs which CDM has applied in more than 90 groundwater modelling projects. Included is a graphic program especially designed for displaying groundwater model data and results.

DYNFLOW simulates three-dimensional groundwater flow using the finite element technique. DYNFLOW is based on the conventional equations of flow in porous media and can be used to simulate the response of groundwater flow systems to several types of natural and artificial stresses. These include: induced infiltration from streams, artificial and natural recharge or discharge, and heterogeneous and anisotropic aquifer hydraulic properties. It solves both confined and unconfined aquifer-flow equations and allows for drainage to local streams if the piezometric head in an unconfined aquifer is at or above the elevation of the streambed.

DYNTRACK is a computer program for the simulation of three-dimensional contaminant transport. DYNTRACK uses the same three-dimensional finite element grid representation of aquifer geometry, flow field and stratigraphy developed for a particular application of the DYNFLOW model.

DYNTRACK simulates the movement of dissolved contaminants in the saturated zone using the calibrated flow fields generated by DYNFLOW. DYNTRACK can perform either simple, single-particle tracking of advective flow or can model three-dimensional contaminant transport with advection and dispersion for conservative constituents, first-order decay constituents, or constituents subject to adsorption.

Both DYNFLOW and DYNTRACK have been independently reviewed and tested by the International Ground Water Modeling Center.

3.12 REMEDIAL INVESTIGATION REPORT

Following the receipt of all analytical data, CDM will prepare a final Phase II Remedial Investigation Report using all current, applicable USEPA guidelines. The report will summarize all site investigations and will be organized and presented such that the relationship between site investigations are apparent. The format for the report is shown in Table 3-4. The report will cross-reference sampling details and the respective analytical or measurement data. The report will also contain the groundwater modelling discussion, the risk assessment and a discussion of remedial action alternatives. The general format is based on the "Draft Guidelines for Conducting Remedial Investigations and Feasibility Studies under CERCLA", USEPA, October 1988.

The report will be submitted to IEPA for review. Following transmittal of substantive comments compiled by the IEPA Project Manager, CDM will revise the report and submit a final report for approval. Upon approval, final copies of the report will be printed and submitted to IEPA for distribution to all involved parties. A total of approximately 25 copies of each report will be prepared for IEPA and USEPA review.

TABLE 3-4
PHASE II REMEDIAL INVESTIGATION REPORT FORMAT

EXECUTIVE SUMMARY

1.0 INTRODUCTION

- 1.1 Purpose of Report
- 1.2 Site Background
  - 1.2.1 Site Description
  - 1.2.2 Site History
  - 1.2.3 Previous Investigations
- 1.3 Report Organization

2.0 STUDY AREA INVESTIGATION

- 2.1 Includes field activities associated with site characterization
  - 2.1.1 Contaminant Source Investigations
  - 2.1.2 Groundwater Investigation
  - 2.1.3 Residential Air Sampling
  - 2.1.4 Residential Well Sampling

3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

- 3.1 Includes results of field activities to determine physical characteristics
  - 3.1.1 Geology
  - 3.1.2 Soils
  - 3.1.3 Hydrogeology

4.0 NATURE AND EXTENT OF CONTAMINATION

- 4.1 Presents the results of site characterization, including both natural chemical components and contaminants in the following media:
  - 4.1.1 Soils and Vadose Zone
  - 4.1.2 Groundwater (each aquifer)
  - 4.1.3 Air

TABLE 3-4
PHASE II REMEDIAL INVESTIGATION REPORT FORMAT (Continued)

5.0 CONTAMINANT MIGRATION IN GROUNDWATER

5.1 Potential Migration Pathways
5.2 Contaminant Migration Rates
5.3 Factors Affecting Contaminant Migration
5.4 Modeling Methods and Results

6.0 CONCLUSIONS AND RECOMMENDATIONS

3.13 COMMUNITY RELATIONS

CDM will provide support to the IEPA in the planning and implementation of a site-specific community relations program for the Southeast Rockford Site. CDM's support will include the following:

- Preparation of documentation, such as diagrams, plans, charts, etc.;
- Provide technical information for the preparation of responsiveness summaries;
- Technical support at public meetings and hearings;
- Other assistance as requested by the IEPA.

IEPA and USEPA will be responsible for all contact with the news media. CDM has allotted a specific level-of-effort and cost to assist IEPA in this function, as detailed in the budget spreadsheet (task 3.13). Expenditures above this level will be considered out-of-scope.

3.14 CDM QUALITY ASSURANCE/QUALITY CONTROL MANAGEMENT

An onsite Field Manager (FM) will be responsible for overseeing the completion of RI field activities in a timely and quality manner. The FM will review the daily work assignments of project team members and will interject technical and managerial guidance as needed to increase the quality and minimize the cost of the work products. The FM is also responsible for satisfying the specific requirements of the QAPP during RI activities. The FM will report directly to the Project Manager (PM).

The Project Manager will coordinate with the Quality Assurance Manager (QAM) for the review of major deliverables and summary documents. A Technical Review Committee (TRC), made up of experts in the areas of risk assessment, hydrogeology, contaminant transport and remediation, will work with the PM and QAM to review documents for technical and management accuracy and completeness before they are released to the IEPA.

3.15 PROJECT MANAGEMENT AND ADMINISTRATION

It is CDM's corporate policy to assign a Client Officer to all projects regardless of size, type or complexity of the assignment. The Client Officer is a senior level manager whose responsibility is to achieve successful completion of the project as well as client satisfaction. While the Project Manager, who will report to the Client Officer, executes the day-to-day management and administrative functions, the Client Officer will be actively involved in the processing and making of all strategic project decisions. In support of the Project Manager, the Client Officer will ensure that the firm's technical specialists and general resources are made available for the project.

Responsibilities of the CDM Project Manager throughout the RI/FS will include the following:

- Coordinate with the IEPA and USEPA to plan the scoping and scheduling of the RI/FS;
- Selecting, coordinating and scheduling staff for task assignments;
- Manage the timely completion of all scheduled activities;
- Controlling budgets;
- Update IEPA and USEPA on all project schedules;
- Attend project review meetings and other meetings necessary for the normal progress of work;

- Monitoring Subcontractors;
- Maintain project quality assurance and quality control;
- Prepare monthly progress reports of technical, schedule and cost status; and
- Evaluate documentation and graphics for compliance with IEPA and USEPA standards.

The CDM Project Manager will prepare monthly progress reports for submission to the IEPA Project Manager, for the duration of project activities. Courtesy copies of these reports will also be copied to the USEPA Remedial Project Manager. These reports will describe the technical progress of the project and will discuss the following items:

- Description of site activity;
- Status of work at the site;
- Percentage of completion and schedule status;
- Problems encountered during the reporting period;
- Actions taken to rectify problems;
- Activities planned for the following month;
- Changes in personnel; and
- Project cost status.

Monthly progress reports will list target and actual completion dates for each task activity, including project completion, and will explain any deviations which have occurred or are anticipated.

3.16 SUBCONTRACTOR PROCUREMENT

Subcontractors will be used for the drilling, soil gas surveying, well surveying and fast turnaround laboratory analysis tasks as described in this work plan. Subcontractors will be selected based upon their qualification to perform the work required, the availability of adequate equipment, cost, ability to meet health and safety requirements, ability to meet the project schedule, and other appropriate criteria which are pertinent to selection of a subcontractor.

Subcontractor(s) procurement will be completed as follows:

- Prepare subcontractor procurement documents (specifications and bidding forms);
- Identify subcontractors and distribute bid documents;
- Receive and evaluate bids;
- Select subcontractors and submit selection to IEPA for approval; and
- Issue subcontracts.

Federal procurement procedures will be followed for all subcontracting tasks estimated to exceed $10,000, with the exception of the soil gas study, which will be sole-sourced to Tracer Research by request of the IEPA.

4.0 FEASIBILITY STUDY

The Feasibility Study (FS) identifies, evaluates and screens available remedial technologies as the initial process in the development of remedial alternatives. Based on the technologies considered applicable, remedial alternatives are then assembled and subjected to an initial screening to identify those requiring more detailed evaluation. As described in Section 3, activities of the FS are intended to be performed in a concurrent and iterative manner with RI activities.

As there are a number of potential contaminant source areas in the Southeast Rockford study area, one or more of these source areas could become separate remedial operable units. A Focussed Feasibility Study, using the methodology of the FS detailed in this section, would be performed to address remediation of each operable unit.

The development of the FS Work Plan as described herein is based on guidelines set forth in the U.S. EPA document, "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (OSWER Directive 9355.3-01, October 1988 Interim Final).

4.1 DEVELOPMENT AND SCREENING OF REMEDIAL ALTERNATIVES

The development of remedial alternatives consists of:

- Documentation of remedial action objectives to address the contamination present at the site;
- Identification of general response actions to meet those objectives;
- Identification and screening of technologies;

- Assembly of remedial alternatives;

- Screening of remedial alternatives.

4.1.1 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

Remedial action objectives are medium-specific goals for protecting human health and the environment. These objectives are developed by identifying the significantly contaminated media, potential exposure routes, and criteria for determining applicable or relevant and appropriate requirements (ARARs) for site remediation. Thus, remedial action objectives address environmental and human health protection by specifying means of reducing human exposure to the affected media as well as reducing contaminant concentrations.

The first step in the process is to identify the specific media which require remediation. Based on the available information for the Southeast Rockford Site, the following contaminated media may require remediation to mitigate existing risks:

- Soil

- Groundwater

- Air

Preliminary remedial action objectives have been developed, and are summarized in Table 4-1. The objectives address each of the identified contaminated media and reflect the general goals for the site. These objectives consider both the exposure routes of concern and the specific areas of existing or potential hazards. This table was generated by taking into account significant site problems and contaminant pathways identified in the Phase I RI Technical Memo. These objectives will be reviewed and revised as additional RI data becomes available and finalized jointly with the IEPA.

TABLE 4-1 REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND POTENTIAL REMEDIAL ALTERNATIVES			
Environmental Media	**Remedial Action Objective**	**General Response Actions**	**Potentially Applicable Technology Types/Options**
Groundwater	**For Human Health** Prevent Ingestion of Water from the Aquifers Having Contamination in Excess of MCLs and/or a Total Excess Cancer Risk of 10^{-5} to 10^{-7} **For Environmental Protection** Prevent Migration of Contaminants from the Aquifers that Would result in Surface Water Contamination in Excess of Local Surface Water Quality Standards Restore Groundwater Quality in Upper Aquifer to Local Surface Water Quality Standards	**No Action/Institutional Actions** No Action Alternative Water Supply Monitoring **Containment Actions** Containment **Removal/Treatment Actions** Collection, Treatment and Discharge or In Situ Treatment of Groundwater Point of Entry Treatment	**Institutional Options**: Alternate Water Supply, City Water, Bottled Water, Point of Entry Treatment **Containment Options:** Boundary Well System **Insitu Biological Treatment** **Groundwater Extraction With Treatment** **Treatment Options:** Physical - Adsorption, Ultrafiltration, Sedimentation, Airstripping Chemical - Neutralization, Precipitation, Ion Exchange, Dechlorination, Oxidation/Reduction Biological - Aerobic, Anaerobic **Disposal Options After Treatment:** Discharge to POTW, Discharge to Surface Water, Re-injection

TABLE 4-1 REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND POTENTIAL REMEDIAL ALTERNATIVES			
Environmental Media	Remedial Action Objective	General Response Actions	Potentially Applicable Technology Types/Options
Soil	<u>For Human Health</u> Prevent Ingestion/Inhalation of and Direct Contact With Soils Having Contaminant Concentrations in Excess of Preliminary Clean-up Levels. Prevent Migration of Contaminants That Would Result in Groundwater Contamination in Excess of MCLs in Aquifers. Prevent Migration of Contaminants That Would Result in Surface Water Concentrations in Excess of Local Surface Water Quality and Sediment Concentrations in Excess of Upstream (Background) Sediment Concentrations. <u>For Environmental Protection</u> Prevent Migration of Contaminants That Would Result in Concentrations in Excess of Water Quality Standards in the Aquifers Prevent Migration of Contaminants That Would Result in Sediment Concentrations in Excess of Background Sediment Concentrations	<u>No Action/Institutional Actions</u> No Action Access Restriction <u>Containment Actions</u> Containment <u>Removal/Treatment Actions</u> Excavation/Treatment/Disposal In-Situ Treatment	<u>Containment Options</u> - Combination of: Capping - Clay, Synthetic Membrane, Multi-Layer Vertical Barrier - Slurry Wall, Dykes, Sheet Piling Horizontal Barrier - Liners, Grout Injection <u>Removal Options</u>: Excavation - Drum and Debris Removal, Solids Excavation <u>Treatment Technologies</u>: Incineration Immobilization - Solidification, Stabilization, Encapsulation Bioremediation Washing and Solvent Extraction Dechlorination Soil Vapor Extraction/Emission Control Low-Temperature Thermal Stipping <u>Disposal Actions - After Treatment</u>: On-Site Redeposit, Off-Site Landfilling

TABLE 4-1
REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND POTENTIAL REMEDIAL ALTERNATIVES

Environmental Media	Remedial Action Objective	General Response Actions	Potentially Applicable Technology Types/Options
Air	<u>For Human Health</u>	<u>No Action/Institutional Actions</u>	Restrict Access - Fencing
	Prevent Inhalation of Contaminants (Particulates) in Excess of PEL and/or 10^{-5} to 10^{-7} Excess Cancer Risk	No Action	Basement Ventilating/Sealing
		Access Restriction	Dust Control - Water, Capping
		Contaminant Plume Control for VOCs Volatilizing from Contaminant Plume	Technologies Applicable to Contaminant Plume Cleanup (Only for VOCs Volatilizing from Contaminant Plume)

Of primary importance in defining remedial action objectives is the development of ARARs for site remediation. ARARs are derived from federal, state, and municipal laws. Under CERCLA Section 121 (d) (2), the federal ARARs for a site would include requirements of any federal environmental laws (e.g., Clean Water Act, Clean Air Act, Safe Drinking Water Act). State ARARs would include requirements of those state environmental laws which are more stringent than federal laws.

4.1.2 GENERAL RESPONSE ACTIONS

General response actions are broad classes of responses or remedies intended to meet the medium-specific remedial action objectives discussed in subsection 4.1.1. Several general response actions have been identified for all contaminated media at the Southeast Rockford site and are summarized in Table 4-1. Although some response actions alone may be capable of meeting remedial action objectives, it is possible that a combination of response actions may prove more effective in meeting the overall site remediation goals and objectives.

4.1.3 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES

Next, potentially applicable remedial technologies for each general response action are identified and further categorized into process options specific to each technology. For example, a clay cap is a specific process option which falls under the category of capping technologies, which in turn falls under the general response action of containment. Next, the technologies and corresponding process options that are applicable for remediation of the site are summarized and screened to eliminate those technologies determined to be inapplicable or inappropriate for further consideration. Potentially applicable technology types and options for the Southeast Rockford Site, based on current information, are summarized in Table 4-1.

Three general screening criteria are utilized to evaluate the applicability of the technology options: effectiveness, implementability and cost. For example, based on the existing data, thermal treatment for soil and sediments would not pass the initial screening because it is not effective for all site contaminants. The remedial technologies that pass the initial screening will be assembled into various alternatives that meet the intent of CERCLA/SARA requirements.

4.1.4 ASSEMBLY OF ALTERNATIVES

In this section, the applicable remedial technologies and process options are assembled into several alternatives that address the contaminated media at the site. Brief descriptions of the technical components of each alternative will be provided, followed by an estimation of the quantities of contaminated media requiring remediation. These remedial quantities provide a basis for evaluating the technical feasibility of the alternatives. This screening process is used to narrow the list of available remedial alternatives that will undergo detailed evaluation.

In selecting alternatives, SARA states "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substance, pollutants, and contaminants as a principal element, are to be preferred over remedial actions not involving such treatment. The off-site transport and disposal of hazardous substances should be the least favored remedial action alternative where practicable treatment techniques are available."

Therefore, remedial action alternatives not utilizing off-site transport and disposal will be evaluated first. It is expected that the alternatives assembled will provide a range of alternatives for contaminated media.

For the Southeast Rockford site the following medium-specific alternatives have been assembled for initial screening:

For Soil:

- No Action;
- Clay Cap and Slurry Wall;
- Soil Vapor Extraction;
- Excavate, Soil Washing/Solvent Extraction;
- In-situ Bioremediation;
- Excavate, Bioremediation;
- Excavate, Dispose Off-Site.

For Groundwater:

- No Action
- Plume Contaminant
- Aquifer Restoration;
- Point-of-Entry Treatment;
- Extraction and Treatment (Physical: Coagulation/Precipitation and Stripping/Adsorption) with Discharge to Surface Water, POTW or Reinjection;

- Air Sparging (limited to defined source areas);

- In-situ Biological Treatment.

4.1.5 SCREENING OF ALTERNATIVES

The remedial alternatives assembled are subjected to an initial screening. The purpose of the initial screening is to reduce, if possible, the number of available alternatives to a manageable number for later detailed evaluation. Three broad screening criteria similar to those used to screen technology options -- effectiveness, implementability, and cost -- are used for screening of remedial alternatives.

4.2 TREATABILITY STUDY

As it is not possible to scope out treatability studies at this time, no costs have been included for this task. However, if a treatability study is required, CDM's approach would be as follows.

Treatability studies would be conducted to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the RI/FS process. The steps involved in conducting treatability studies include the following:

- Determine data needs;

- Review existing data on site and available literature on technologies to determine if existing data are sufficient to evaluate alternatives;

- Perform treatability tests to determine performance, operating parameters, and relative costs;

- Evaluate the data.

Data requirements may be identified by the groundwater modeling effort and from conducting extensive literature surveys to determine whether the performance of the technologies being considered is sufficiently documented on similar wastes, to gather information on relative costs, applicability, removal efficiencies, O&M requirements, and implementability, and finally, to determine testing requirements for bench or pilot studies.

Treatability studies will be conducted if technologies have not been sufficiently demonstrated or characterization of the waste alone is not adequate to predict treatment performance or to estimate the size and cost of appropriate treatment units. Treatability testing may consist of aquifer pumping tests or may be performed on contaminated media by using bench-scale or pilot-scale techniques. Bench-scale testing will be performed in a laboratory to test both performance and waste-composition variables. This kind of testing, which can be performed over a few weeks or months, will only be a small portion of the total RI/FS cost. Pilot studies will be performed to evaluate the physical as well as chemical parameters of a full-scale treatment process. The treatment unit sizes and the volume of waste to be processed in pilot units will be designed as small as possible to minimize costs, yet large enough to obtain the data required for scaling up the equipment appropriately. Pumping tests would be performed in the field to evaluate regional aquifer properties such as hydraulic conductivity, transmissivity, and storativity.

Treatability studies are often required for the following technologies in order to determine their site-specific effectiveness: Soil Washing/Solvent Extraction, Solidification, Oxidation/Reduction, Coagulation/Precipitation, Dechlorination, Air Stripping, and Carbon Adsorption.

Treatability studies will also be conducted when necessary to evaluate the effectiveness of multiple technologies employed in series. For example: Soil Washing/Solvent Extraction followed by Solidification or Air Stripping followed by Carbon Adsorption.

4.3 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

CDM will perform a detailed evaluation of all remedial alternatives which pass the initial screening. The detailed evaluation will include the following:

- Detailed descriptions of each alternative with an emphasis on the volume or area of contaminated media, the technologies to be used, and performance requirements for those technologies.

- Assessment of each alternative in terms of effectiveness, implementability and cost, with emphasis on the nine factors outlined in CERCLA as amended by SARA, Section 121(b). These factors are:

    - Short-Term Effectiveness;
    - Long-Term Effectiveness and Permanence;
    - Reduction of Mobility, Toxicity and Volume;
    - Compliance with ARARs;
    - Overall Protection of Human Health and the Environment;
    - Implementability;
    - Cost;
    - State Concurrence;
    - Community Acceptance.

4.3.1 EFFECTIVENESS

The effectiveness of an alternative entails how protective it is of human health and the environment over both the short and long term and whether it attains federal and state ARARs. Specific evaluation criteria which must be addressed are:

- Short-term Effectiveness -- Examines the effectiveness of the alternative in protecting human health and the environment during the construction and implementation period until response objectives have been met.

- Long-term Effectiveness and Permanence -- Evaluates the long-term effectiveness of alternatives in protecting human health and the environment after response objectives have been met.

Each alternative will be evaluated to determine the alternative's public health effects. Each alternative will be addressed in terms of the extent to which it will mitigate potential harm to public health and relate to the time required to achieve a given level of response in comparison to the other remedial alternatives. The time required to achieve a given level of response consists of the time required to implement an alternative and the time it takes to see beneficial results (which is often delayed beyond the construction period). Beneficial results should be defined as the reduction in levels of contamination necessary to attain or exceed relevant or applicable standards.

The public health analysis consists of a baseline site assessment, an exposure assessment, and a comparison of environmental concentrations to relevant and applicable standards. First, a baseline site assessment is conducted where all data on the extent of contamination, contaminant mobility and migration, and types of alternatives are reviewed. The result of the baseline assessment is the determination of data required to conduct an exposure assessment and the level of detail in this assessment.

Second, an exposure assessment will be conducted. A qualitative exposure assessment is required for source control actions to evaluate the types, amounts, and concentrations of chemicals at the site; their toxic effects; the proximity of target populations; the likelihood of chemical release and migration from the site; and the potential for exposure.

Following the exposure assessment, estimated environmental concentrations of the indicator chemicals selected for the site (if a large number of chemicals are present) are compared to applicable or relevant environmental standards such as those found in RCRA regulations, National Interim Primary Drinking Water Standards, Maximum Contaminant Levels, National Ambient Air Quality Standards, etc., as well as EPA criteria for noncarcinogens, carcinogens, and health advisories. When no applicable standard exists, at least one alternative should be aimed at a 10^{-6} risk level, and other alternatives in the 10^{-4} to 10^{-7} risk level. The exposure assessment will be conducted for the short-term (i.e., during remediation), and long-term (i.e., following remediation) scenarios.

Also, the safety of onsite workers during remediation will be evaluated. Safety is defined as the security and freedom from risk, loss, injury, harm and danger. Factors to be considered during implementation of the remedial measures will include short and long-term threats to the safety of the contractors/operators, the community living and working in the site vicinity, and the environment and nearby facilities.

An environmental assessment of each alternative will be conducted in terms of the extent to which it will mitigate damage to the environment. The assessment will address the value of contaminated or threatened areas, identify anticipated impacts, and assess the general significance of the impacts. All alternatives, including the no-action alternatives, will be evaluated, except those determined during the screening to result in any of the following:

- A substantial increase in airborne emissions;

- A new discharge to surface or groundwater;

- An increase in the volume of loading of a pollutant from existing sources or a new facility to receiving waters;

- Known or expected significant adverse effects on the environment or on human use of environmental resources;

- Known or expected direct or indirect adverse effects on environmentally sensitive resources or areas, such as wetland, prime and unique agricultural lands, aquifer recharge zones, archaeological and historical sites, and endangered and threatened species.

In such cases, the reasoning for not evaluating the alternative will be stated. The level of detail for the evaluation will depend on the degree of actual or potential damage to the environment. The evaluation should discuss both adverse and beneficial results associated with the remedial alternative such as improvements in final environmental conditions, improvements in the environment, and improvements in human use of the resource, or adverse effects resulting from construction/operation activities and mitigation measures.

4.3.2 REDUCTION OF TOXICITY, MOBILITY AND VOLUME

This assessment evaluates the desired performance of the specific treatment technologies. Three items must be addressed: (1) Will the alternative result in toxicity? (2) Will the alternative increase or decrease mobility? and (3) Will the alternative reduce, increase or eliminate the volume of contaminants? A comparative situation existing between alternatives should also be addressed.

4.3.3 COMPLIANCE WITH ARARs

This assessment describes how the alternative complies with ARARs, or if a waiver is required, how it is justified. The assessment also considers information from advisories, criteria, and guidance. The remaining feasible remedial alternatives shall be evaluated on the basis of institutional concerns or factors that may impact implementation. Compliance with all applicable or relevant and appropriate federal requirements will be evaluated as well as other federal criteria, advisories, and guidance, and state or local/municipal standards.

Applicable requirements are those which would legally apply to the response or remedial action if that action was not undertaken pursuant to CERCLA's relevant and appropriate requirement standards, those designed to apply to circumstances sufficiently similar to those encountered at CERCLA sites in which their application would be appropriate at a specific site, although not legally required.

For each alternative, all applicable or relevant and appropriate requirements will be discussed and the degree of compliance of onsite activities or the resulting permit requirements for off-site activities will be stated. In general, it is expected that regulatory programs under the Resource Conservation and Recovery Act (RCRA), the Safe Drinking Water Act (SDWA), the Federal Water Pollution Control Act (Clean Water Act or CWA) and the Clean Air Act (CAA) will have the broadest application to remedial alternatives. All guidance or advisories such as the Groundwater Protection Strategy which will help to evaluate an alternative will be mentioned. There are also many agencies which can provide valuable assistance in the implementation of an alternative. All agencies requiring consultations will be listed. A partial list may include the following:

- Illinois Department of Public Health;
- U.S. Department of Health and Human Services;
- Federal Emergency Management Agency; and
- National Park Service.

Finally, assurance must be given that the Community Relations Program complies with the National Environmental Policy Act (NEPA) by allowing both the opportunity and time for the public to review the draft feasibility study. This objective will be fulfilled in this project by allowing a 60-day comment period for the draft feasibility study.

4.3.4 IMPLEMENTABILITY

Applicable remedial alternatives will be evaluated for implementability. The major elements of implementability are technical feasibility, administrative feasibility, and availability of required resources.

- Technical Feasibility - Assessment of technical feasibility is based on reliability, performance, and flexibility. Two aspects of remedial alternatives that provide information about reliability are the operation and maintenance requirements and their demonstrated reliability at similar sites. Operation and maintenance (O&M) requirements should be assessed by the availability and cost of necessary labor and materials, and the frequency and complexity of O&M activities.

- Administrative Feasibility - This is a measure of community and state acceptance of an alternative, as well as that of other agencies that need to approve operations.

- Availability - This refers to the availability of treatment, storage, and disposal services and equipment, as well as the constructability of an alternative. A remedial alternative can be evaluated for its implementability by its relative ease of installation or constructability.

4.3.5 COST ANALYSIS

The cost of each feasible remedial action alternative remaining after initial screening will be evaluated. The evaluation will include each phase or segment of the alternative and consider cost and non-cost (i.e., loss of natural resources) criteria. The cost of each alternative will be presented as a present worth cost and shall include the total cost of implementation and annual operating and maintenance costs. A distribution of costs over time will also be provided. A table showing the above cost information for each alternative will be included.

In developing detailed cost estimates, the following steps are to be taken:

- Estimation of Costs -- Determine capital and annual operating costs for each remedial alternative.

- Cost Analysis -- Using estimated costs, calculate the stream of payments and present worth for each remedial alternative.

- Sensitivity Analysis -- Evaluate risks and uncertainties in cost estimates; cost estimates should be within +50 and -30 percent of the actual cost.

- Input to Cost-Effective Analysis -- Identify input data and reliability necessary to evaluate cost-effectiveness of remedial action strategies.

4.3.6 OVERALL PROTECTION

This assessment describes how the alternative as a whole achieves and maintains protection of human health and the environment.

The purpose of this task will be to summarize, in a comparative format, the results of the detailed evaluation of alternatives in terms of overall protection. Based upon this summary, the most cost-effective alternative for IEPA's consideration is determined. This alternative will, at a minimum, comply with all applicable, relevant, and appropriate requirements (which, in effect, means it mitigates and minimizes threats to and provides adequate protection of the public health, welfare and the environment).

In selecting the appropriate alternative however, IEPA must consider all cost, technological, and administrative limitations in achieving different levels of protection of the public health and environment. All alternatives should be ranked based on the following overall protection levels: minimal, substantial, or permanent. Alternatives will be judged against each other in terms of overall rank.

4.4 DRAFT FEASIBILITY STUDY REPORT

A draft Feasibility Study Report will be prepared at the completion of the alternatives evaluation process. The report will present a detailed discussion of technologies considered, alternatives assembled and screened, and the detailed analysis of post-screening remedial alternatives. The report will conform to the EPA guidance document for RI/FS work. It is anticipated that the draft FS report will be serially reviewed by IEPA and USEPA.

4.5 PUBLIC COMMENT AND ROD PREPARATION SUPPORT

The objective of this task is to provide post-FS support in the form of a responsiveness summary from the public meeting, and through clarification of material during record of decision (ROD) preparation.

CDM will assist the IEPA in preparing a responsiveness summary. The summary will be prepared following completion of the public comment period on the draft final RI/FS. It is expected that IEPA will prepare the necessary responses to comments received before and during the comment period. The responsiveness summary will summarize public comments and describe how IEPA responds to issues raised by the public.

4.6 FINAL FS REPORT

The objective of this task is to incorporate comments received from the IEPA and USEPA and public (as compiled by IEPA); to revise the draft Feasibility Study Report accordingly; and include Conceptual Design in a final report.

CDM shall prepare a final report which addresses the IEPA, USEPA and the public comments compiled by IEPA, as well as the results of the feasibility study as a predesign report section. Any supplemental information will be included in appendices. An example format for the FS report is presented as Table 4-2.

The deliverable for this task will be a final public comment FS report.

4.7 PROJECT MANAGEMENT

This task provides the necessary level of effort to manage and administrate the FS. The task includes the level of effort required to maintain close coordination with the IEPA and the USEPA, to implement Quality Management procedures, and to put in place an effective schedule and financial monitoring and control system to ensure completion of the project within established schedule and budget. The project management activities will parallel those described in subsection 3.15 for the Remedial Activities.

TABLE 4-2
FORMAT FOR PHASE II
FEASIBILITY STUDY REPORT

Executive Summary

1.0 Introduction

- 1.1 Site background information
- 1.2 Nature and extent of problems
- 1.3 Objectives of remedial action

2.0 Screening of Remedial Action Technologies

- 2.1 Technical criteria
- 2.2 Remedial action alternatives developed
- 2.3 Environmental and public health criteria
- 2.4 Other screening criteria
- 2.5 Cost criteria

3.0 Remedial Action Alternatives

- 3.1 Alternative 1 (No Action)
- 3.2 Alternative 2
- .
- .
- .
- 3.N Alternative N

4.0 Analysis of Remedial Action Alternatives

- 4.1 Noncost criteria analysis
  - 4.1.1 Technical feasibility
  - 4.1.2 Environmental evaluation
  - 4.1.3 Institutional requirements
  - 4.1.4 Public health evaluation
- 4.2 Cost Analysis

5.0 Summary of Alternatives

6.0 Recommended Remedial Action (optional)

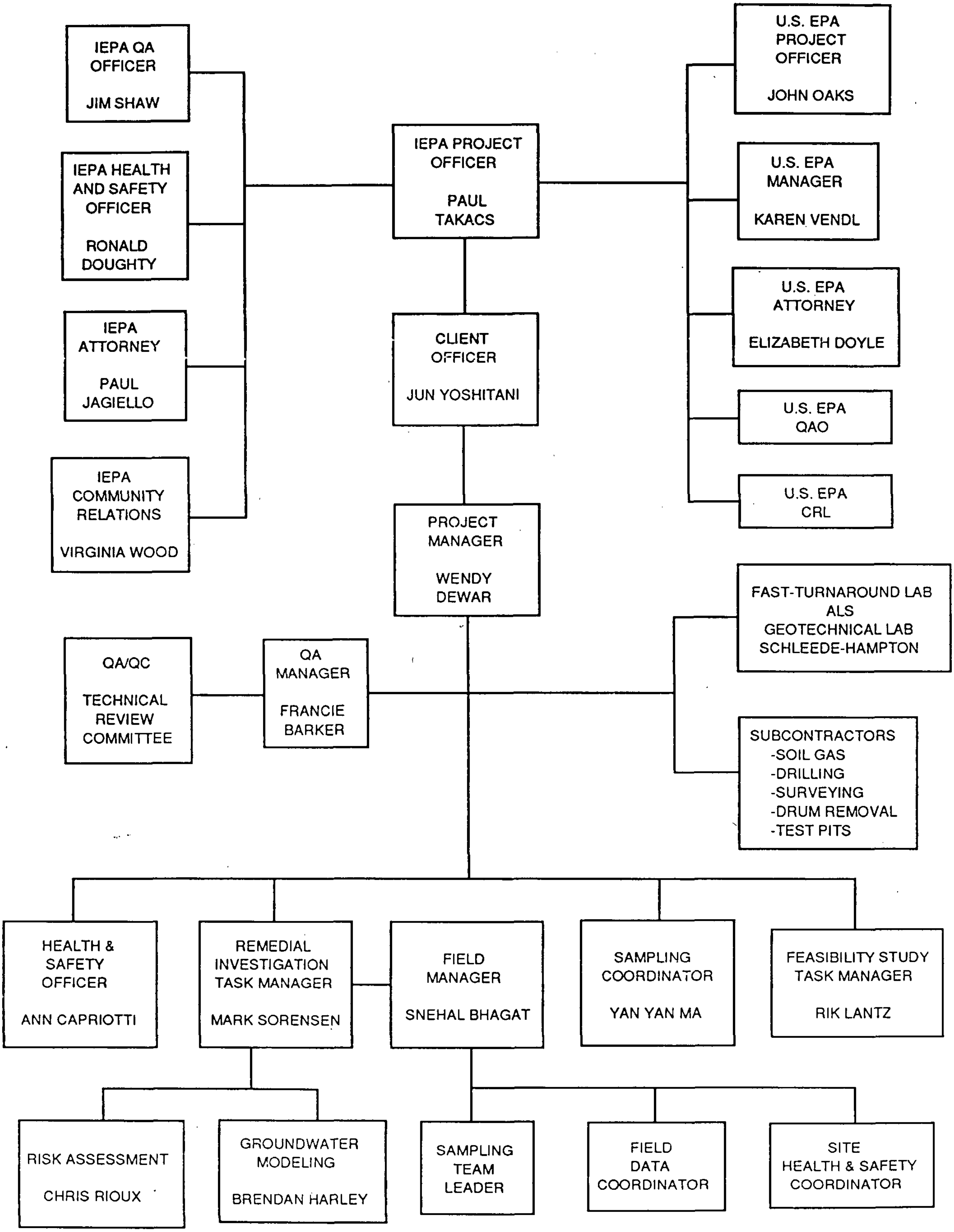
7.0 Responsiveness Summary (in final version only)

References
Appendices

5.0 PROJECT STAFFING

CDM has selected members of the project team to best match the skills of the individuals to the needs of the project. Personnel assigned to the project and their areas of responsibility are shown on Figure 5-1.

FIGURE 5-1
SOUTHEAST ROCKFORD PHASE II RI
ORGANIZATION CHART

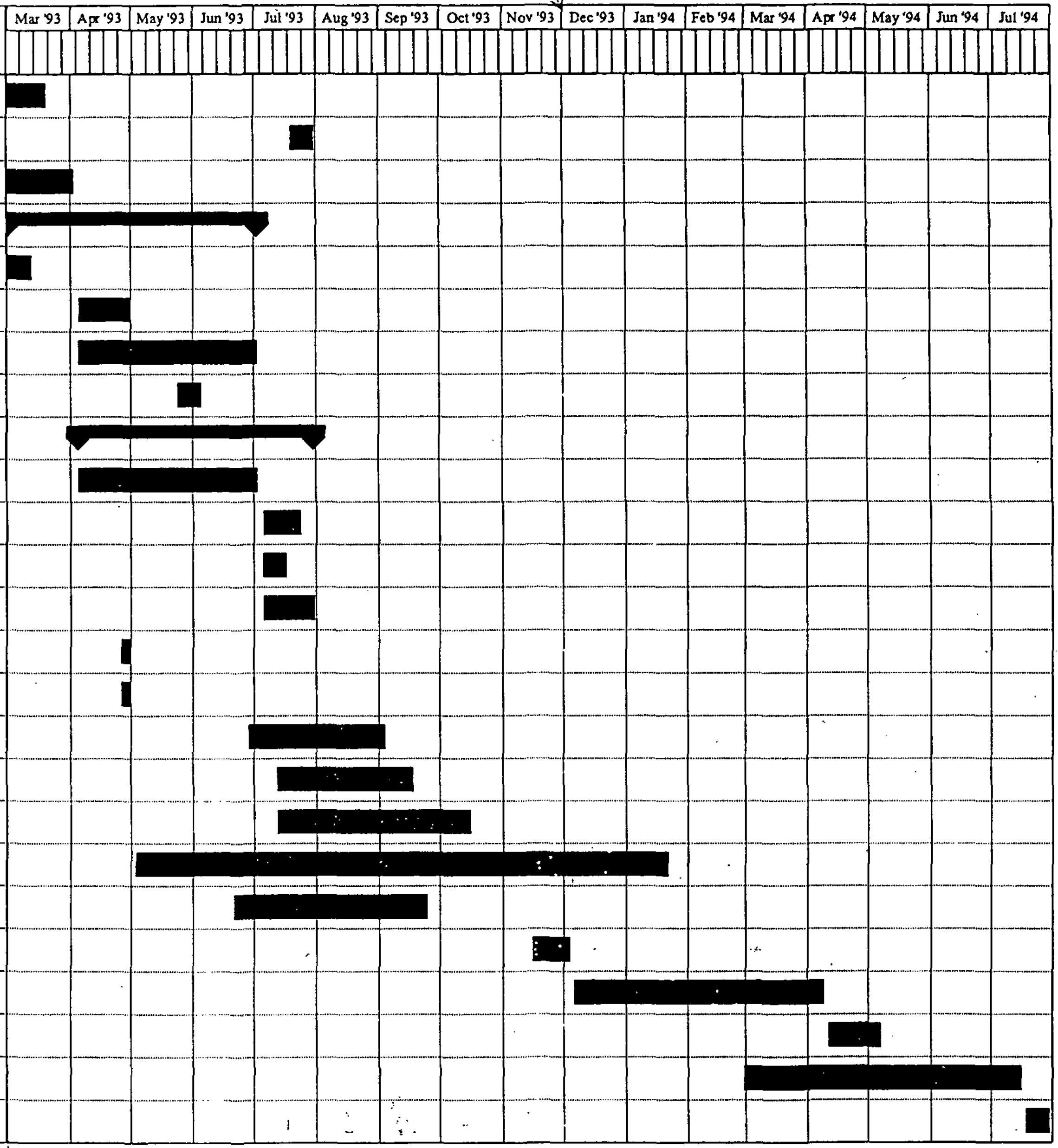


6.0 PROJECT SCHEDULE

The schedule for conducting the Southeast Rockford Phase II activities is shown on Figure 6-1. The schedule illustrates the chronological coordination of tasks from the date of project plan approval.

Figure 6-1
SOUTHEAST ROCKFORD PHASE II RI/FS SCHEDULE

Task No.	Task	Duration
3.1	Finalize Project Plans	3w
3.3	Detailed Site Map	2w
3.4	Mobilization	5w
3.5	Source Investigation	18w
3.5.1	Existing Information Review	2w
3.5.3	Soil Borings	4w
3.5.4	Monitoring Well Drilling and Installation	13w
3.5.6	Area 7 Test Pits	2w
3.6	Groundwater Investigation	17w
3.6.1	Monitoring Well Drilling and Installation	13w
3.6.1.6	Hydraulic Conductivity Testing	3w
3.6.1.7	Monitoring Well Surveying	2w
3.6.2	Monitoring Well Sampling	4w
3.6.3	Residential Well Sampling	1w
3.6.4	Residential Air Sampling	1w
	Laboratory Analysis	10w
3.9	Data Validation	10w
3.10	Risk Assessment	14w
3.11	Groundwater Modeling	38w
3.12	Draft RI Report	14w
	Final RI Report	3w
4.4	Draft Feasibility Study	18w
	Agency Review	4w
4.5	Public Comment and ROD Support	20w
	Final FS Report	2w



Project: Southeast Rockford
Date: 3/8/93

APPENDIX A

WORK PLAN ADDENDUM
FOR
SOURCE AREA 7

CDM

environmental engineers, scientists, planners, & management consultants

CAMP DRESSER & McKEE INC.

200 West Adams Street, Suite 1600
Chicago, Illinois 60606-5208
312 786-1313

May 13, 1992

Mr. Steve Washburn
Project Manager
Federal Sites Management Unit
Division of Land Pollution Control
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794-9276

Dear Mr. Washburn:

This letter work plan describes the tasks to be performed to further screen Source Area 7 for buried wastes and provides the associated cost estimate for these tasks. This work will be performed as an addendum to the Phase I scope of work; however, the funding will not be available from the Phase I budget. CDM assumes that the funding for these tasks will be available under the Multi-Site II Contract No. FLC-2008 from the monies set aside for the Phase II activities. These tasks will be performed using the protocols described in the Final Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) for the Southeast Rockford Groundwater Contamination Phase I Project dated February 1991. The Phase I Health and Safety Plan will be adhered to for the field activities. The specific task descriptions and sample locations are provided in the following paragraphs and Figures 1 through 3.

Table 1 provides the budget detail for these tasks. The total cost for these tasks is estimated to be $30,369. CDM assumes that U.S. EPA will provide a Ground-Penetrating Radar Unit with operator to assist with performance of the scope described herein. Tracer Research will be subcontracted to CDM to perform the soil gas survey using the protocols in the Phase I Final QAPP and SAP.

Yours very truly,

CAMP DRESSER & McKEE INC.

Wendy Dewar

Wendy Dewar
Project Manager

WD:st

Attachment

1681-02.3

WORK PLAN ADDENDUM FOR ASSESSMENT OF POTENTIAL SOURCE AREA 7

Introduction

This work plan addendum presents a description of proposed work to be completed to assess the existence and extent of contaminated wastes that may have served as source areas for contaminated groundwater observed at nearby well MW106A and other wells downgradient (west-northwest). The initial work to be completed at potential source area 7 will be installation of a surveyed grid system to allow accurate placement of locations to be tested in the electromagnetic, ground-penetrating radar, and soil gas surveys. Grid lines will be run east-west and north-south by a licensed surveyor, and points will be marked on the ground with laths at 50-foot intervals. The area to be gridded is indicated on Figure 1. The work described herein will be performed as an addendum to the Phase I scope of work. These tasks will be performed using the protocols described in the final Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) for the Southeast Rockford Groundwater Contamination Phase I Project dated February 1991.

Field observations indicate that several areas in potential source area 7 contain various types of waste materials near the ground surface. Historical aerial photos give further such evidence. Between at least 1958 and 1970, photographs show that two small valleys southeast of MW106 were likely used for disposal of various materials. These and other past and present features are shown on Figure 1. East of MW106 a gravel pit was started by 1958. Excavation at the pit reached a peak in 1970 when the side walls produced pronounced shadows and the areal extent was approximately 200 feet by 400 feet. Other sizable disturbed areas that may have been excavations are visible in the 1970 photo, and are located northeast of the former gravel pit. Smaller areas devoid of vegetation are visible on one or more photographs from between 1958 and 1970. These various areas may have been locations of disposal of contaminated wastes that led to the groundwater contamination observed at MW106 and areas downgradient (west-northwest). The source of this contamination is most likely located in the general area shown in Figure 1 because: 1) monitoring wells upgradient of this area show very low contaminant concentrations; and 2) the contamination of MW106 is predominantly limited to the upper well, suggesting a nearby source.

Electromagnetic Survey Plan

A terrain conductivity electromagnetic (EM) survey will be performed over part of potential source area 7 as an addendum to Phase I field work. The purpose of the EM survey is to delineate high-conductivity areas which may indicate buried metal, such as drums; such areas may have been used for disposal of contaminated wastes. The EM survey will be performed over the portions of potential source area 7 not covered by the initial survey run in March 1992, as shown in Figure 2. The area south of the 4N line was surveyed for conductivity using the EM-31 meter during an initial survey conducted by the U.S. EPA in March 1992. Therefore only the remaining portion of the grid need be surveyed for conductivity during this subsequent effort. The outlines of the areas identified as being anomalous in March will be ground-surveyed for their coordinates in the grid system shown in Figure 1, and the coordinates recorded in the field log book. Additional conductivity readings may be collected in these areas during the proposed survey to verify or more accurately outline the anomalous areas noted in the initial survey.

The remainder of potential source area 7 must be surveyed for terrain conductivity. The EM survey will consist of measuring and recording terrain conductivity values along the grid lines spaced at 25 feet. Along a specific grid line, instrument readings will be recorded at 5-foot intervals using a data logger. The equipment to be used will be a Geonics EM-31 terrain conductivity meter equipped with data logger. The meter operates on a self-contained battery pack. The sensitivity range will be adjusted in the field to provide the maximum sensitivity, such that the readings are generally in the upper one-half to two-thirds of the scale. The operator will position the EM meter over the survey location and the conductivity value (in millimhos/meter) will be automatically recorded by the data logger. Field notes will also be taken to account for the possibility of data logger or computer malfunction. Where anomalous conductivity readings are noted, additional surrounding points may be measured in order to define the outline of the anomalous area. The EM31 can be read continuously while the operator walks, allowing the ability to define anomalously conductive areas with relatively high accuracy. Station designations (based on the coordinate system of Figure 2) and conductivity readings will be recorded by the data logger and in the field log book. Following the survey of the area, the presence and locations will be noted of any visible or suspected features that may influence readings, such as overhead wires, metal poles, near-surface wastes or disturbed soils.

Ground-Penetrating Radar Survey

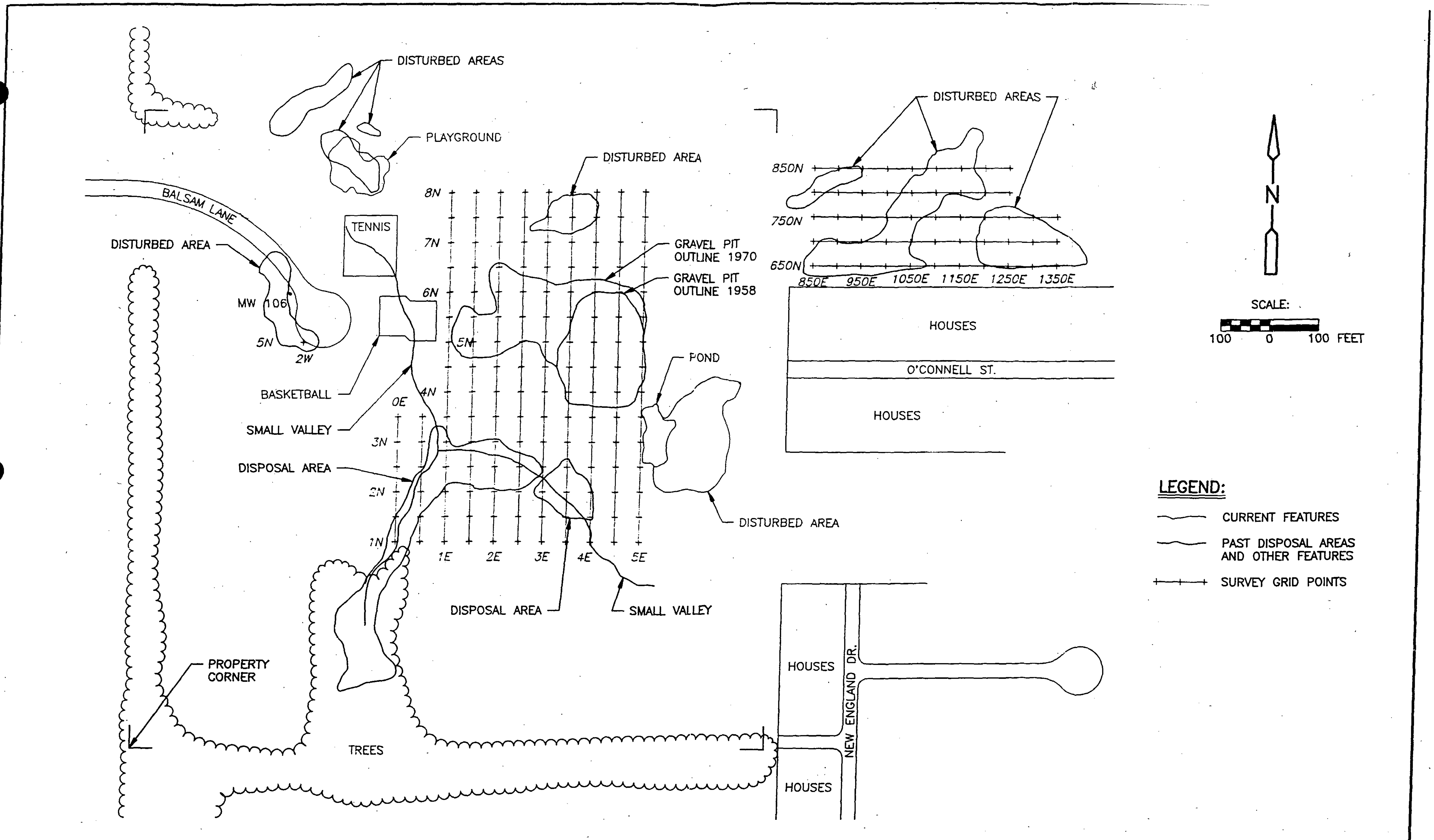
The ground-penetrating radar (GPR) survey will be conducted after completion of the EM survey, so that it can be performed in areas shown to be anomalously conductive by the EM survey. The GPR operation and instrumentation will be provided by U.S. EPA personnel. In general, the GPR survey will be conducted across anomalous areas at 25-foot intervals.

It is assumed that six anomalous areas will be defined, and that approximately eight points in each area will be measured by ground-penetrating radar, for a total of forty-eight points to be measured.

Soil Gas Survey Plan

The soil gas survey will be performed across portions of potential source area 7 by Tracer Development Corp., Tuscon, Arizona. The soil-gas procedures will be as described in the Phase I approved QAPP of February 1991. The areas to be covered are shown on Figure 3. The selection of these areas is based on the possibility of waste disposal activities as suggested by the aerial photographs. A total of 58 points in three separate areas will be tested in the soil gas survey, at grid intervals of 100 feet. Though the full chromatograms of soil-gas analyses will be retained, only the compounds of concern tetrachloroethene (PCE), trichloroethene (TCE) and 1,1,1-trichloroethane (TCA) will be quantified in the field. It is likely that some soil-gas samples will contain anomalous concentrations of the compounds of concern. When such locations are encountered, surrounding locations at lesser intervals will be tested for soil gas constituents in order to define the outline of the area with anomalous concentrations. Such locations will be based on relative compound concentrations and the locations of the anomalous points.

The EM, GPR, and soil-gas surveys have been designed to define potential subsurface contaminant source areas. This work will be followed up in summer 1992 with Phase II field work that will focus on verification of the existence and extent of the various source areas defined in this Phase I addendum; this Phase II work will consist of drilling and soil sampling of subsurface borings, as well as installation and sampling of monitoring wells.



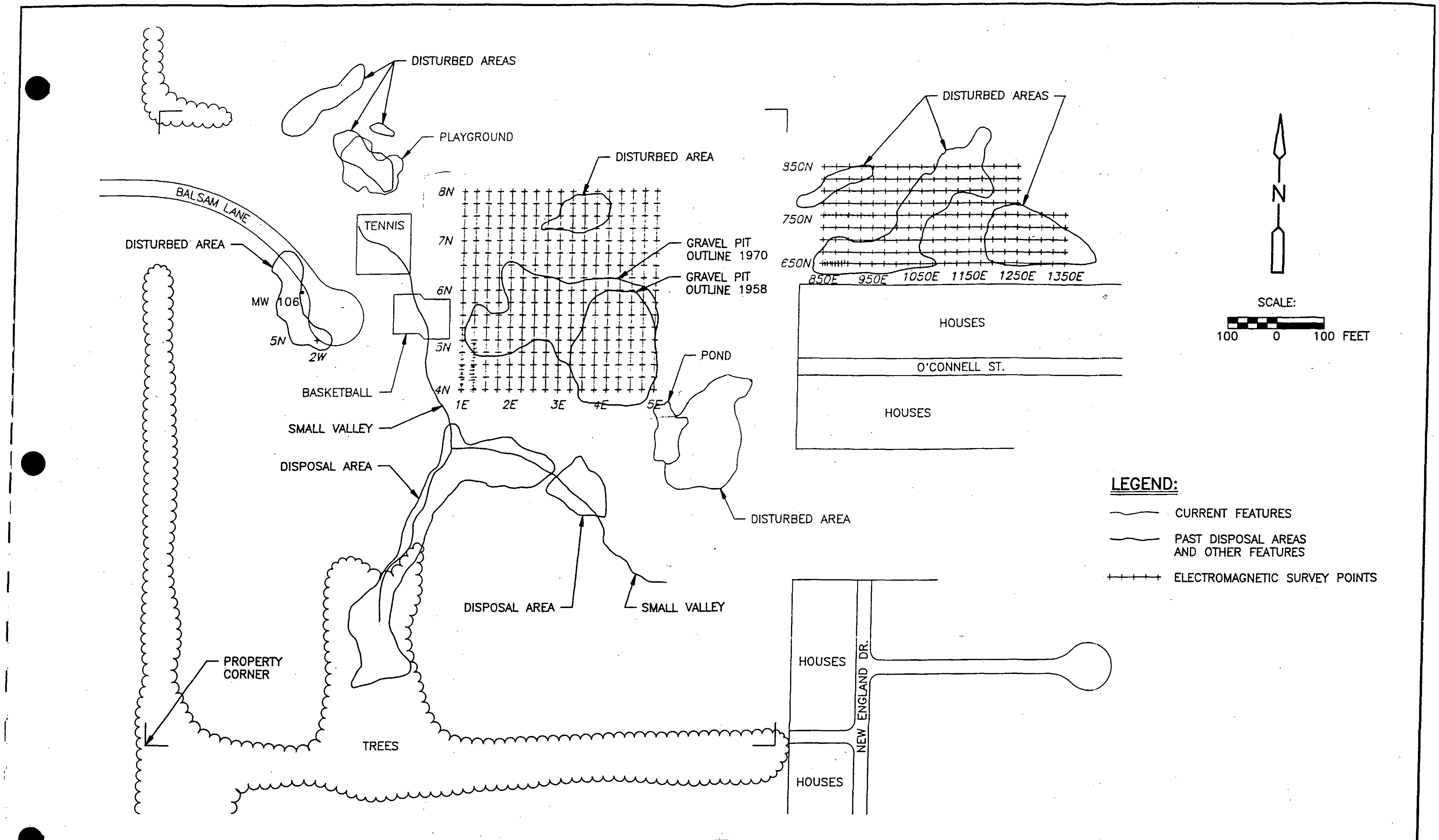
SOUTHEAST ROCKFORD

POTENTIAL SOURCE AREA 7 – CURRENT AND PAST FEATURES, AND PROPOSED SURVEY GRID

CDM
environmental engineers, scientists, planners, & management consultants

Figure No. 1

05/15/92 B. SELIGA



SOUTHEAST ROCKFORD

POTENTIAL SOURCE AREA 7 – CURRENT AND PAST FEATURES, AND ELECTROMAGNETIC SURVEY POINTS

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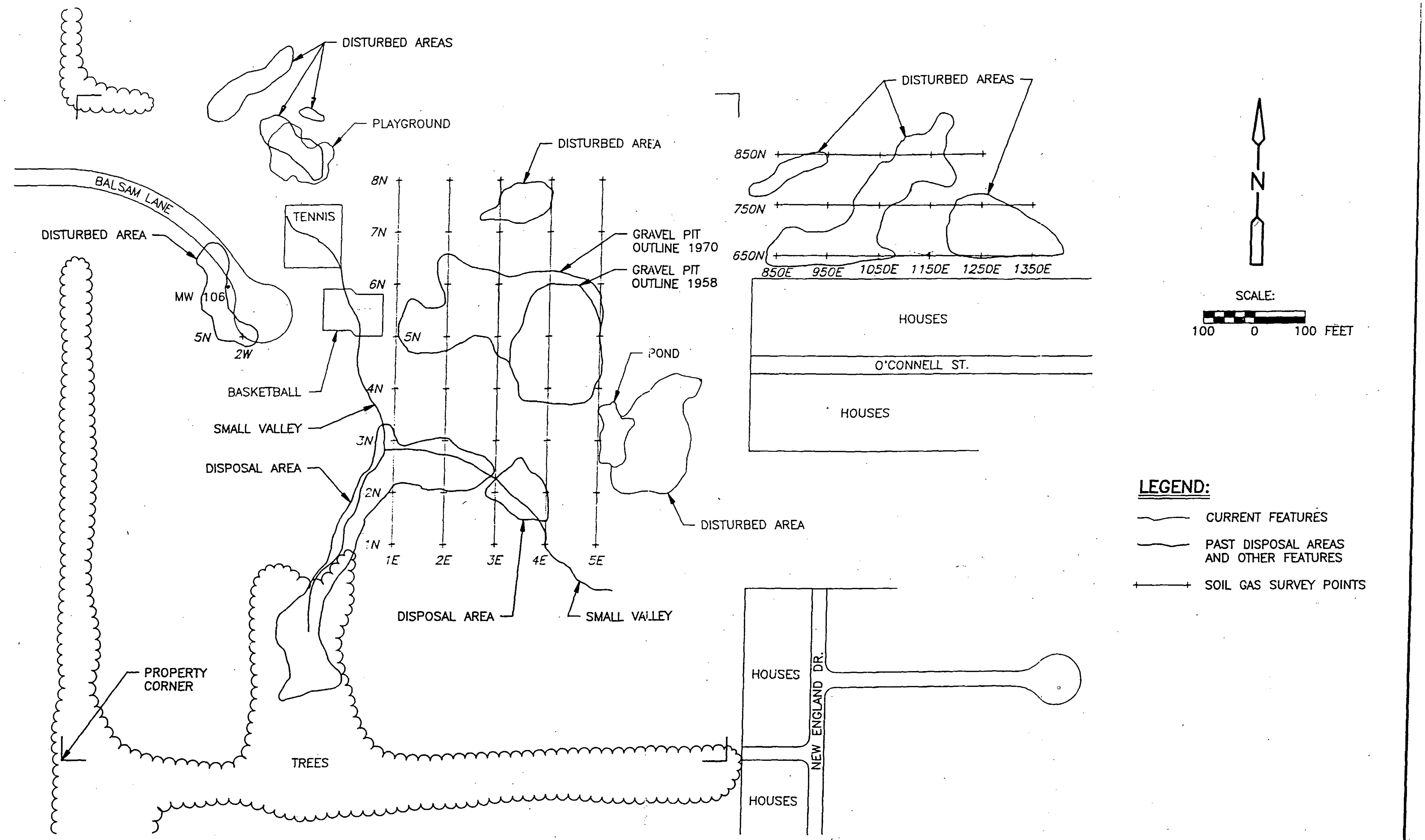
Figure No. 2



SOUTHEAST ROCKFORD

POTENTIAL SOURCE AREA 7 – CURRENT AND PAST FEATURES, AND SOIL GAS SURVEY POINTS

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Figure No. 3

05/12/92 B. SELIGA